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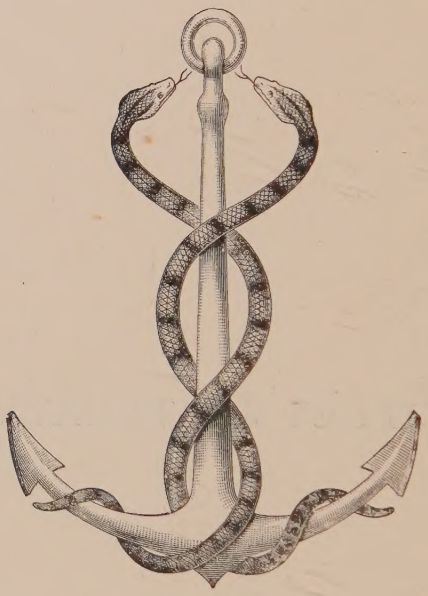

NUNQUAM ALIUD NATURA, ALIUD SAPIENTIA DICIT.

THE PRINCIPLES OF TREATMENT

AND THEIR APPLICATIONS IN PRACTICAL MEDICINE

BY

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NEW YORK MEDICAL
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EDINBURGH AND LONDON
YOUNG J. PENTLAND
1901

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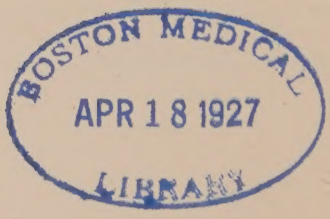

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TO

MY FAITHFUL FRIEND

T. Lauder Brunton

M.D., D.SC. EDIN., LL.D. ABERD., F.R.S.

PHYSICIAN TO ST. BARTHOLOMEW'S HOSPITAL

WHO FIRST INSPIRED ME WITH AN INTEREST IN PHARMACOLOGY

AND THE PRINCIPLES OF THERAPEUTICS

AND

TO MY BROTHER

William Bruce

M.A., M.D., LL.D.

DIRECT REPRESENTATIVE FOR SCOTLAND ON

THE GENERAL MEDICAL COUNCIL

MY EARLIEST INSTRUCTOR IN PRACTICAL MEDICINE

I DEDICATE THIS BOOK

AS A TOKEN OF AFFECTION AND GRATITUDE

PREFACE

An apology may reasonably be looked for from one who ventures to write a book on the Principles of Treatment. In the present instance the Author has sufficient excuse for his undertaking. In the course of a long and intimate association with Students of Practical Medicine, he has come to realise more and more fully the immense difficulties which they feel, particularly the highly educated Students of the present time, when they are called upon to show an intelligent acquaintance with treatment. They may write a prescription with little hesitation; but as a rule they cannot give a rational account of the principles on which they have planned it. They fail to do justice to themselves, that is, to the immense amount of sound knowledge which they have laboriously acquired; and instead of pursuing the strictly scientific methods in which they have been trained, they too often resign themselves to the observance of some routine system of treatment which they have read up; for, however unwilling we may be to confess it, simple authority is still very largely the ordinary guide in medical practice. The course that the Author has long followed, both in the classroom and at the bed-side, is to direct the attention of Students first and chiefly to the objects of treatment, which their study and observation of pathological

and clinical facts reveal to them; and thereafter, and not till then, to discuss the selection of medicinal and non-medicinal measures calculated to effect the desired ends. The present work is planned on the same lines. It starts by assuming no therapeutical laws, but proceeds to find them in the familiar facts of ætiology, pathological anatomy, and the clinical characters of disease. These are carefully examined for the elementary principles of treatment; and in the course of the enquiry the student is taught how he may himself employ his observations as guides to practice. Having mastered the most simple therapeutical principles, the reader is led up to higher generalisations, which relate to the Nature of Disease and its proper relation to Treatment.

The principles of treatment are difficult to discuss, and still more difficult or impossible to appreciate, without illustrations of them in connexion with individual diseases. Throughout the first part of the work this proposition is respected, and no statements of principles are made without reference to some familiar instances in which they apply. Any attempt, however, to enter into the details of treatment in that connexion would have led to lengthy digressions from the main subject and defeated the object of the work, the study of principles. It has therefore been arranged to present a certain number of illustrations in an entirely separate section, constituting Part II., where they may be read in more connected form, and possibly serve at the same time as useful guides in actual practice. Further, advantage has been taken of this arrangement to furnish a series of illustrations of the art of treatment, including prescribing. The reader will understand that this part of the work makes no pretence to be a complete guide to the Practice of Medicine. It is

intended only to show how the lessons previously learned can be applied in the treatment of some of the most familiar, best marked or most important diseases.

In conclusion, the Author begs to express his gratitude for the valuable help that he has received in the preparation of the work from several of his friends, particularly Dr. Galloway, Dr. John Harold, and Dr. Rennie of Sydney, who have read the proof sheets and favoured him with invaluable criticisms. Dr. E. Q. Thornton, Demonstrator of Therapeutics and Pharmacy at Jefferson College, Philadelphia, has adapted the prescriptions to the United States Pharmacopœia, and thus made them available for use in America. The Author is also under deep obligations to his old friend and colleague Miss Frances Humfrey, formerly senior Sister of Charing Cross Hospital, who has very kindly revised the portions of the book relating to nursing, and freely placed at his service her extensive and intimate knowledge of this department of practical treatment. Mr. Archibald Clarke has prepared the index with his well-known intelligence and care.

London, *November* 1899.

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PART I.

PRINCIPLES OF TREATMENT

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PRINCIPLES OF TREATMENT

CHAPTER I.

INTRODUCTION. PLAN OF THE WORK. MEANING OF INDICATIONS FOR TREATMENT.

THERAPEUTICS involves two principal considerations: the ends to be attained by treatment, and the means of attaining these ends. The first of these subjects is too often subordinated to the second. A knowledge of ways and means is as necessary as a knowledge of what requires to be done, but must not usurp its place. The first question in general therapeutics as well as in practice is, What are the *objects* of treatment?

The answer to this question can be found only in one way: by an appeal to knowledge based on correct observation. To learn the first principles of treatment we should have to search the natural history of disease, from its origin in certain causes, through its different phases as revealed by pathological and clinical characters and course, to its termination either in recovery or in death. An intelligent study of these subjects ought to lead us to certain conclusions as to the need, the opportunities, and the advantages of therapeutical interference, whether as an attempt to prevent disease, to remedy it, or to relieve the suffering which attends it. The ends, objects, or aims thus discovered, if they were clearly expressed, would constitute *the indications for treatment.*

This plan will be followed in the present treatise. The

student will be led from the individual facts of disease to obvious therapeutical indications. We shall not start from artificial systems — "allopathic," "homœopathic," "hydropathic," etc. Aspiring to be recognised as scientific, medicine "appeals not to authority, nor to what anybody may have thought or said, but to nature."[1] We shall bring to bear upon the problems of hygiene and therapeutics all the knowledge of medicine and the medical sciences that we have acquired by our work, reading, and reflexion; and the principles on which we found our methods will be the consummation of this knowledge. We shall thus be in a position to formulate the principles of treatment on rational lines, and to give other reasons for our practice than authority, expediency, or even experience. No doubt we may expect to find in the course of our enquiry plenty of evidence of useful treatment that cannot yet be accounted for on scientific grounds. Many of the most successful therapeutical measures that we employ are still empirical. Experience must continue to dictate certain methods of treatment until medicine has become perfect as a science.

Now although every kind of medical knowledge that we possess—normal anatomy and physiology, ætiology, pathology, and the living (clinical) history of morbid processes—must be pressed into our service in this enquiry, it is unnecessary to examine laboriously and separately the whole of the medical sciences in search of the principles of therapeutics. There are three kinds of knowledge that may be expected to furnish us directly with indications for rational treatment, namely, ætiology, anatomical and chemical pathology, and the clinical relations of disease. These, when taken together, might be said to constitute the natural history of disease as it presents itself to the practitioner. They are knowledge proper: they deal with facts, not opinions: however imperfect many of them still may be, they are the outcome of actual observations.

Ætiology deals with the origin of disease; with the efficient causes that are at work; with Natural Resistance to them; with the circumstances which predispose to disease; and with

[1] Huxley, "Science and Culture," 1888, p. 15.

those which determine its occurrence. Ætiology is calculated to furnish us with guiding principles of an invaluable order, which should enable us to strike at the very roots of disease —indeed at the germs of disease and the soil from which it springs.

Pathology will unveil to us the anatomical and chemical characters of the condition for which our interference is required; also how much of it is truly morbid, how much recuperative. The very lesion, the change in structure and composition of the affected tissue, and the evidences of Natural Recovery should all be full of therapeutic suggestions.

Clinical Medicine and Surgery, in the most comprehensive sense of the words, complete the sum of knowledge which we shall have to search for principles of treatment. They include all that we learn by the study of the phenomena of disease in the living body, the methods of Natural Relief, the course, complications, duration, and terminations of disease, and the results of attempts at treatment. It is mainly in its clinical relations that disease comes before the practitioner; and the symptoms, signs, and the course of disease from day to day, as well as the personal peculiarities and circumstances of the individual patients, cannot fail to furnish us with a number of guides to the details of treatment.

The student will observe that the three groups of facts which we propose to examine in the following pages—ætiology, pathology, and clinical history—are not mutually exclusive, and are not employed in the present enquiry as logical divisions of the subject of disease. Pathology involves ætiology. Many causes, such as parasites, persist and take an active part in pathological processes, and some of them constitute even the chief pathological and clinical features of the disease. Clinical characters are but manifestations to the practical observer of the actions of causes and the life-phenomena of pathological processes. Ætiology, pathology and clinical characters are simply three different aspects of one great history, which have to be discussed separately in order to simplify the argument.

The reader must also be careful to remember the exact scope of this enquiry. We are entering on a study of the

ætiological, pathological and clinical relations of disease from a therapeutical point of view, and from this only. It will not be necessary for us, therefore, to do more than examine under each of these heads such facts as are likely to furnish us with the kind of information which we seek, namely, direct indications for treatment. As these are discovered they will have to be reviewed collectively at the end of the section, for the purpose of arriving at more general principles and of estimating the practical value of our conclusions. Finally, we shall have to take a comprehensive survey of the indications which we have formulated, and to enquire whether still wider generalisations can be reached with respect to the essential relations of therapeutics to disease, and whether from these there may not be drawn principles of treatment deserving to be regarded as fundamental.

Having completed our discussion of the objects of treatment, we shall next have to turn to the means which are available for carrying these into effect. This division of the subject will be dealt with summarily, and will be planned mainly to show how the therapeutical principles which have been reached can be more or less successfully fulfilled with the medicinal and non-medicinal measures at our command. But even a knowledge of the principles and the possession of the means of treatment do not complete the necessary equipment of the practitioner. What is meant by the Art of Treatment will form the subject of the concluding chapter of the first part of the work.

CHAPTER II.

PRINCIPLES OF TREATMENT FOUNDED ON ÆTIOLOGY.

INTRODUCTORY—ORIGIN OF DISEASE—NATURAL RESISTANCE—SEARCH FOR ÆTIOLOGICAL INDICATIONS.

A KNOWLEDGE of the causes of disease lies at the foundation of rational treatment. Not only the existence of causes and the kinds of them, but the ways in which they reach and affect the body, and the ways in which the body meets them, must be understood by the therapeutist and the sanitarian.

The *efficient causes* of disease, the disturbing or pathogenetic influences which invariably precede disease and without which disease does not occur, are very numerous, but the generic variety of them is not great. They comprise, amongst others, agents of mechanical and chemical injury; extreme degrees of heat and cold; poisons, whether recognised as such or in the air, water, etc.; unsuitable food; and parasites, one great group of which are the pathogenetic micro-organisms. To these must be added intrinsic influences (including certain congenital forces) which can be traced ultimately to extrinsic influences. In a word, the causes of disease consist in natural influences. We observe and investigate them; many of them we believe we now understand; and we are convinced that such causes as are still obscure or still entirely undiscovered are also natural influences—for example, the cause of rheumatism. All knowledge confirms the belief that there is no disease which may not be accounted for in this way.

This statement, simple as it appears to be, represents the sharp line of division which exists between the legitimate

Medicine of to-day and the irrational empirical systems of early times, of superstition, of uncivilised peoples and of quackery. The causes of disease are no longer regarded as being supernatural. In a discussion on the principles of treatment three hundred years ago, causes would have been represented as spirits, witchcraft, the evil-eye, etc.; to be met by appeals to the supernatural, by the use of spells and incantations, by the king's touch, and like means. Even as lately as thirty years ago the prevention of an acute specific disease like typhoid fever was impossible and hopeless, for it was believed to originate in a mysterious "epidemic influence." To-day this is a comparatively easy matter, now that the efficient cause of typhoid fever is known to be a micro-organism with a natural history outside the human body.

In most instances the efficient causes of disease are favoured by circumstances which reside or exist within the body itself and consist in inadequacy, imperfection, or impairment of the tissues or the vital forces. Assisting efficient causes indirectly, these circumstances are said to "predispose" the body to disease, to be *predisposing causes*, to constitute predisposition as a quality, attribute, or element of the constitution. Such are age (that is, all ages in different instances), sex, congenital malformations, and inherited or acquired weakness of structure or function. Previous disease is responsible for a considerable proportion of diseases. Cerebral hæmorrhage and softening, for example, and many of the diseases of the spinal cord are thus caused by some general or local pathological condition which precedes them or predisposes to their occurrence. A remote injury to a joint often proves to have established a permanent weak spot, which becomes the least resistant part of the body to the incursion of rheumatism and gout. Anatomical structure and position have a similar effect as predisposing circumstances, of which the apex of the lung in tuberculosis, the sciatic nerve in relation to strain and cold, the great toe in gout, the vermiform appendix in respect of injury and precarious nutrition, and the simple proximity of the liver to the stomach in hydatid invasion of the viscera furnish instructive illustrations.[1] A number of personal

[1] Coats, *Brit. Med. Journ.*, London, 1889, vol. ii. p. 409.

qualities, inherited or acquired, also appear to unfit certain individuals for meeting with safety the efficient causes of disease.

Regarded from the strictly scientific point of view, predisposition, increased susceptibility to efficient causes, vulnerability (all synonymous terms) is not some entity, a property or condition of or within the body which ought not to be there. On the contrary, it is the absence or deficiency of a property or power which the body normally possesses, and which is known as Resistance or Natural Resistance. Age, sex, inheritance, previous disease, and other predisposing causes are circumstances which lower Natural Resistance. This is their true position ætiologically, and instead of "predisposition" we speak of Diminished or Deficient Resistance.

It is of the last importance to Medicine that the meaning of this expression "Natural Resistance," so dangerously easy of employment, should be clearly understood. We might be only too ready to believe, with some of our predecessors, that natural resistance is an independent or special force or property resident in the tissues, a *vis conservatrix Naturæ*. This is not so. Resistance is the attitude which the body assumes and maintains towards morbific influences by the exercise of purely physiological functions. As it is by these that health and life are maintained, so it is by these that disease and death are kept at bay. Maintenance of health and Resistance to disease are synonymous terms. It is as strictly physiological to escape or oppose the causes of injury and death, such as extreme cold or extreme heat, by avoiding them or counteracting them, as it is to sustain life by alimentation and respiration. Indeed healthy alimentation and respiration are as much dependent on resisting what is bad in food and in air as on taking advantage of what is wholesome and pure in them. These methods of natural resistance are inseparably associated with or identical with the ordinary physiological processes, much as prosperity is insured in the daily life of the State by the exercise of good government in every relation. But whilst it is not a special force, natural resistance has special mechanisms solely preventive of disorder or disease: regulating and controlling the different

physiological systems, securing mutual harmony, and dealing with disturbing influences from without or from within of a morbific character, much in the same way as the State has organised certain of its constituent members into a navy, army, constabulary, and other associated services of an official kind, with whom the duty lies of protecting and preserving it against its enemies without and within.

Resistance in its different forms being understood to be physiological, we may venture to speak of the arrangement as a *Natural Provision* for resistance. The reader must understand that in using the expression "provision" we do not imply or desire to convey the idea of personality or purpose resident within the tissues in connection with their resistant function any more than in connection with such ordinary physiological functions as appetite and digestion. "Provision" is simply a short and convenient term for the lengthy and cumbersome expression "physiological arrangement to effect a definite end."

The other order of circumstances which favour the efficient causes of disease are the so-called *determining causes or exciting causes.* In the first place, some of them assist the efficient cause *directly.* Locality, climate, season, weather and occupation are often in this way ætiological factors, because it is under certain circumstances connected with them that efficient causes like temperatures, micro-organisms and poisons are afforded opportunities of development and of access to man. It is as determining circumstances or *media* that water and the water-supply, drainage, habitations and in part food come to be causes of disease. A certain geographical position determines the occurrence of yellow fever and of malarial disease. Certain climates powerfully favour the prevalence of malaria; certain kinds of pathogenetic microbes flourish only in summer weather: brewers' draymen are by occupation peculiarly liable to alcoholism from constant temptation and opportunity to drink. Certain mental states, such as grief and despair, so powerfully determine the act of poisoning that they and not the drugs are regarded as the cause of the morbid result and death as well as of the crime. It is obvious that the ætiologist and practitioner have here a large and ever

widening field of enquiry and treatment—particularly with respect to the circumstances and conditions generally which favour and check, respectively, the virulence and multiplication of micro-organisms and other parasites in their life apart from the body.

In the second place, circumstances excite or determine the origin of disease *indirectly*, by lowering natural resistance. Cold may suddenly depress resistance to micro-organisms. An attack of acute gastric catarrh determines the invasion of cholera not by directly introducing the bacillus into the body, but by temporarily converting the secretion of the stomach from acid juice to alkaline mucus in which the comma bacillus flourishes and is conveyed into the bowel. Acute septic peritonitis owns micro-organisms as its efficient cause, but the disease would not occur if some event such as strangulation of bowel or appendicitis did not lower the vital resistance which renders the intestinal wall impenetrable by them. Strain or other injury determines the invasion of a joint in gout and gonorrhœal arthritis. "Influenza," says Broadbent, "opens the door to typhoid fever."[1]

In practical medicine it is frequently impossible to unravel the mutual complexity of efficient causes, on the one hand, and predisposing and determining circumstances on the other hand. So slight may be the efficient cause which originates disease in the presence of the latter, that they appear to be the more potent of the ætiological conditions underlying it. A sharp cough may be the efficient cause of pneumothorax, yet the predisposing circumstance—tuberculosis of the lung and pleura, which reduced the resistance of the tissues—is of course the only cause practically regarded. Indeed under powerfully predisposing circumstances disease may be produced by simple physiological influences. An ordinary meal, a moderate change of external temperature, may injure the body in some subjects. In primary muscular atrophy of children nutritional stability is so low, natural resistance so feeble, predisposition so powerful (all synonymous expressions) that ordinary (healthy) conditions of daily life are sufficient to cause degeneration in the course of a few years. In a word, predisposing and

[1] *Brit. Med. Journ.*, London, 1895, vol. ii. p. 1494.

determining circumstances are often as important factors as the efficient cause; and they may be quite obvious and easily reckoned with when the efficient cause is unknown or unassailable. Thus we may be able to ascertain them, and to modify them for prophylactic and therapeutical purposes in addition to efficient causes, differently from these, apart from them, and when they are unknown. We cannot deal directly with the efficient cause of gastric ulcer, for we are ignorant of its nature; but we can prevent a recurrence of the disease nevertheless by safe-guarding women, particularly domestic servants, between the ages of fifteen and thirty from strain and stooping and coarse food.

We shall now study some of the principal kinds of efficient causes, taking them up one after another and examining them in association with the predisposing and exciting circumstances which assist them individually. This mode of discussion is the most natural one to follow, and will best suit our present purpose. We shall try to learn the individual principles on which disease is to be prevented and remedied from the side of its origin. In order to do so we shall have to keep in the foreground as the subject of chief interest to us the physiological actions displayed by the body in relation to pathogenetic influences: its behaviour towards them; the ways in which the body meets them, and how it fails to do so; the methods, the scope, the limits of Natural Resistance. By following this plan we may hope to discover how occasions and opportunities arise for interference with them in such ways as to prevent or to remedy disease.

Micro-organisms.

The first group of recognised causes of disease which we propose to examine in our search for therapeutical indications founded on ætiology are the pathogenetic micro-organisms. We are not concerned here with the different kinds and effects of these. We have only to regard them as a great class of morbific agents, and to study the ways in which the body deals with them.

When micro-organisms come in contact with the body they are met by various obstacles to their progress. First there are the integuments, a means of simple or passive *defence* of the delicate vulnerable cells of the working tissues. The openings of the mucous tracts are also carefully protected. The entrance to the respiratory passages, the vestibule of the nose, is guarded by vibrissæ and tenacious mucus, which successfully bar it against microbes.[1] If these fail, the invaders are met by a higher order of protective provisions, the reflex mechanisms of sneezing, cough and expectoration, as well as ciliary action and mucous flow, the effect of which is to *remove* them from the position which they have gained. Nictitation and lachrymation fulfil a similar purpose in connexion with the eye; vomiting in connexion with the stomach; diarrhœa in connexion with the bowel. The acid gastric juice destroys putrefactive organisms, which are swallowed abundantly with food.

Unfortunately these mechanisms, sensitive and active though they be, are of very limited range, and frequently fail to exclude or remove pathogenetic organisms from the body. It is probable that the upper respiratory passages deal far more successfully with germs than we commonly believe; but for all this, micro-organisms are constantly overpowering them by their numbers and virulence. The mechanisms themselves also may be at fault. The integuments are easily wounded, and the micro-organisms, abundantly sheltered on the surface of the body, immediately pour into the tissues. Pathological changes in the respiratory mucosa permit the establishment of germs on the affected parts; and even the delicate lesions produced by the inhalation of sharp particles of dust (metal or mineral) in certain occupations are sufficiently large breaches in the wall of defence to admit the tubercle bacillus. Gastric catarrh enables the cholera bacillus to pass through the stomach with impunity and enter its proper field of activity within the intestine. In laryngeal disease and paralysis we find a common cause of broncho-pneumonia, so-called inhalation- or vagus-pneumonia.

[1] St. Clair Thomson and Hewlett, *Med.-Chir. Trans.*, London, vol. lxxviii. p. 248.

When pathogenetic organisms penetrate the surface of the body or a mucous membrane they are met by a provision for passively *protecting* the individual cells. A micro-organism has passed the different barriers and entered the substance of the body; but it produces no morbid effect. The body is immune. This fact is familiar; the explanation of it is still a subject of discussion. The simplest form of protection against an infectious disease is the result of a previous attack of it, or of some modification of it (variola, vaccinia). The injection of attenuated virus has been employed by Pasteur and his followers as a therapeutic measure on the same principle, to render the body refractory. All this is generally recognised; but whether the blood-plasma or the cells are the seat of the change which renders the body immune is a question of great difficulty. For our present purpose the conclusion may be accepted as legitimate: that in some at least of the instances in which persons exposed to contagion resist the successful incursion of it, they are protected by a previous experience of the disease, whether in fully developed or in modified form. We might even venture farther and suggest that in some instances of successful resistance to contagious disease, without previous experience of it in any form, the body possesses—and perhaps has acquired by a process of natural selection—a property or constitution which renders it an unfit medium for the development of specific organisms. Indeed we might dare to assume that this constitution is present in all healthy persons as regards certain organisms, although of very different degrees; and constitutes a natural provision for resistance by virtue of which (at least in part) a considerable proportion of a population always escape epidemics.

Immunity very often fails. It is weaker in the infant, exposed for the first time to contagion, protected only by its inherited constitution. It unquestionably becomes exhausted by lapse of time, as the facts of vaccination and revaccination prove. It is unaccountably defective in some individuals, who suffer, for instance, from repeated attacks of such diseases as measles and scarlet fever. Visceral disease increases susceptibility to infective disease. Unsoundness of the kidneys and circulation

is universally recognised as amongst the gravest conditions of diminished resistance to the effects of infective diseases. General exhaustion is a complex state which has a similar effect. Low, nervous conditions, the result of depressing emotional disturbances, such as fear, are also regarded as weakening resistance to infectious disease. Local immunity may be insufficient, in consequence of disease, or even from natural disability of a part, like the apex of the lung and the appendix vermiformis.

Besides this provision for what might be called internal defence, it appears that micro-organisms, when they penetrate the tissues, meet with active opposition. They encounter the phagocytes, one of the actions of which is to assail and *destroy* pathogenetic organisms. This kind of resistance is distinctly aggressive. The phagocytes march out and attack the invading causes of disease. When it is energetic, extensive and sustained, phagocytosis is associated with inflammation, and in that connexion will call for further consideration under the head of Pathological Indications. It was once believed that phagocytes destroy organisms by a process of digestion; that is, that the foreign organisms are attacked not only as enemies but as prey.

But phagocytosis is not always successful. In the struggle between micro-organisms and phagocytes the former are often observed to kill the latter, as well as the other elements of the tissues which they attempt to defend. The causes of such failure of the phagocytes probably lie either in their comparative feebleness, or in the virulence and numbers of the invading micro-organisms. It is obvious that the first of these causes brings us back once more to the constitutional vigour of the body, which varies so much in different individuals, at different times, and otherwise under different circumstances. When the issue of the struggle threatens to be unsuccessful from the side of the phagocyte, a curious phenomenon is observed, which is known as negative chemiotaxis. Diapedesis does not occur. The phagocytes remain within the vessels, keeping at a safe distance, as it were, from the enemy, and practically avoiding the causes of disease. Sometimes, it is said, negative chemiotaxis becomes positive

by a kind of custom. Familiarity gradually dispels fear, and we are reminded here of acquired immunity.

The last stage of phagocytosis is the *removal* of the micro-organisms from the body, through the lymphatics, the circulation and the ordinary organs of elimination. In this way these efficient causes of diseases, and their pathogenetic products as well, are expelled finally from the system.

Indications for Treatment—Preventive and Remedial.—When we review the preceding facts, it becomes clear to us that micro-organisms as causes of disease may rationally be met either (*a*) *directly*, that is, by dealing with the micro-organisms themselves, whether before or after their contact with the body; or (*b*) *indirectly*, that is, by dealing with the body and reinforcing its natural resistance. These two orders of therapeutical measures have to be discussed separately and at some length.

(*a*) *Direct Prevention and Remedy.*—The first indication which presents itself to one's mind for dealing with micro-organisms directly when they have been proved to be pathogenetic, is to *destroy* them; and we have found a biological confirmation of this principle in phagocytosis. Brilliant results of the application of this principle are obtained by destroying microbes before their contact with the body, in the way of public and private sanitation. The removal and destruction of dirt, including sewage; the use of disinfectants in the house and by public authorities; the disinfection of the subjects of contagious diseases during and after illness, and of their discharges, rooms and clothing; the filtration of water; the employment of thorough boiling and cooking before the domestic use of water, milk, meat and other kinds of food: these are but a few instances which will serve as illustrations.

When pathogenetic micro-organisms have come in contact with the body, they are attacked with disinfectants or germicides. The surgeon is laboriously careful to destroy the last microbe on the skin before he begins an operation; if he finds a septic wound his first object is to disinfect it. It may be truly said that the greatest triumphs of therapeutics as judged by results have been obtained by antiseptic surgery, with which the name

of Lister will ever be associated. Disinfection is also effected within the mucous cavities and tracts of the body. When a safe disinfectant can reach pathogenetic microbes in these situations they are destroyed with little difficulty. Torulæ and sarcinæ are killed in the dilated stomach; intestinal decomposition, in its many pathological relations, is arrested by means of drugs; the putrefactive organisms of bronchiectasis and possibly even of tuberculosis are destroyed *in situ* by means of intra-pulmonary injections and less certainly by inhalations.

How far destruction of micro-organisms as causes of disease can be successfully carried on within the blood and tissues is doubtful. The problem is mainly how to do so without danger to the body-cells. Even now it cannot be regarded as proven that quinine meets the malarial organism directly in the blood and kills it. A similar action of salicyl compounds in rheumatism and of mercury in syphilis is purely hypothetical, like the assumption of the existence of germs as the causes of these diseases; but the temptation is very strong to reach so obvious and easy a conclusion. It is possible that antitoxins act in this way, as immediate poisons to the corresponding microbe; more probably they do so by destroying the toxins or by producing immunity, as we shall presently see. When the *modus operandi* of these most promising therapeutic agents has been determined, we hope to be in a position to speculate usefully on the physiological actions of arsenic, mercury and other drugs as "specifics." Fortunately our scientific ignorance does not lessen the practical value of these remedies, established empirically, although our scientific ignorance undoubtedly limits the applications of them, and prevents an exact or refined employment of them.

These powerful and successful measures do not exhaust our methods of dealing with micro-organisms as causes of disease. Instead of attempting to destroy them we may simply *remove* them from the body. Ordinary personal cleanliness of course has this effect, as represented chiefly by the bath, and by the thorough use of soap and water and the scrubbing brush before operations. In respect of treatment in disease, removal of the specific cause is the principle on which we permit or

induce vomiting at the invasion of infectious fevers, and give a purge to encourage diarrhœa in enteric catarrh and cholera. The maintenance of a certain number of stools daily in typhoid fever similarly removes from the body infective material of different kinds, variously associated with the specific pathological process. And it need hardly be said that the surgeon regards continuous and thorough evacuation and discharge of all septic matters as an essential element of treatment.

In a certain number of instances, as experience teaches us, the most satisfactory way of dealing with pathogenetic micro-organisms is to *neglect* them. Such are the causes of diseases that run a very mild and brief course, particularly diseases like varicella, which not only are insignificant in themselves but affect the body only once, and affections like nasal catarrh where the common cures are more troublesome than the disease. Indeed this principle of neglecting or ignoring the causes of disease is sometimes extended until it comprises what appears at first sight to be a paradoxical indication—to despise pathogenetic microbes so much as to permit or even encourage them to do their worst. There are still many practitioners of opinion that it is better to let a child have measles, Rötheln and varicella (and perhaps whooping cough) "and done with them." The idea contained in these various methods of deliberately producing or permitting a disease is that it shall be taken at a time, at an age, and under circumstances, which are all the most favourable possible to recovery, and that the subject shall be for ever after protected against them. Probably no one in these days would deliberately expose a child, however strong, to the contagion of even the mildest exanthem for the purpose of having it over; but the notion need not be hastily dismissed, especially as it impresses on us the converse fact of the unpreparedness of many delicate children to encounter acute illness.

(*b*) *Indirect Prevention and Remedy.*—The second great order of prophylactic and remedial measures indicated by a study of the natural history of micro-organisms and the different ways in which the body meets them, *are brought to bear upon the body itself.* The objects of them are to lessen predisposition or otherwise reckon with it by strengthening

or restoring natural resistance; and to counteract the effects of the microbes.

The most obvious of all methods is simple *protection*. Antiseptic dressings in the strict sense of the term are employed with this object—to insure asepsis: to keep a clean wound from becoming infected by micro-organisms. The infinite value of Listerism need not be insisted on again. Somewhat feeble attempts in the same direction are made with "respirators," which possibly may act by partly arresting micro-organisms as they enter the nose and mouth. Of great promise therapeutically is the method which might be called internal protection, and which consists in fortifying the blood and tissues against the arrival of micro-organisms. Quinine taken prophylactically by a person entering a malarious district probably acts in this way. The value of vaccination as a preventive of variola is similarly explained. Antitoxins appear to be successful by being protective rather than directly germicidal, that is, by so altering the "constitution" or "crasis" of the blood and the condition of the tissues, that micro-organisms find the soil unfit for them and perish accordingly. We are thus introduced by easy stages to the great and universally recognised indication for the prevention and control of infective disease—the maintenance of a sound constitution. The vital importance of robustness and vigour of body-constitution—partly inherited, partly acquired, and in relation to sex, different ages, and the circumstances of life as a whole—need not be dwelt upon. We must be careful, however, not to take too general and indefinite, and therefore unpractical, a view of constitutional resistance. We must not forget that involved in it, and an essential element of it, is the absence of local disease of every individual organ; and also that the body is only as strong as its weakest part, for example in relation to the tubercle bacillus. Many of the gravest of the diseases caused by micro-organisms are so powerfully predisposed to by previous disease that the connexion of the efficient cause—the micro-organism—has only quite lately been appreciated. Acute peritonitis secondary to appendicitis, hernia and other intestinal obstructions is a striking instance in point. It is for a similar reason that we are careful

to insure complete recovery in acute disease, whether local or general; that we remove "the dregs" of measles and whooping cough lest tuberculosis supervene; that we insist on a sufficient period of convalescence to restore bodily substance and vigour. We never despise little illnesses, especially in the delicate or in the subjects of tuberculous families, and hasten to remove even disorders, short of actual disease. It is also imperative to attend to the activity and soundness of the organs which, as we have seen, are specially concerned in different ways with resisting micro-organisms. The skin is to be kept scrupulously clean. The reflex mechanisms of defence are not forgotten, particularly if they be deficient in readiness and completeness of action as they are in older subjects, or be the seat of disease. Thus the cornea must be artificially protected in affections of the trifacial nerve, if ulceration is to be prevented; and care must be exercised in feeding aged and debilitated paralysed patients lest inhalation pneumonia be produced.

Although so much can be done to fortify the body, both locally and as a whole, against the incursions of micro-organisms; although we can directly deal with them successfully in many instances, and in other instances make light of their effects; still the wisest course to follow may be to flee from them or give them a wide berth, just as the phagocyte displays negative chemiotaxis. *Avoidance* of acute infectious diseases is carried out both publicly and privately on recognised systems. The medical officer of health declares certain countries, towns, streets or houses infected, and stops communication with them excepting under strict regulations. He proclaims a public well to be polluted, and closes it for a time. The traveller finds it better to shun invaded countries or routes during a cholera epidemic than to carry out the alternative measures of disinfection and self-protection. Susceptible persons—children especially—are removed (with due precautions) from an infected house. Malarious districts are shunned, particularly by persons who have already suffered from ague. Susceptible persons are careful to avoid the atmosphere of tuberculous patients unless disinfection of the sputa be practised. We recommend the unfortunate subjects of hay fever to take a

voyage in the month of June. All these are illustrations of the principle of avoiding the causes of disease.

The effects of micro-organisms and their poisonous products in the blood and tissues also call for treatment, as we shall find in our study of pathological indications.

Animal Parasites.

This is a definite class of morbific causes which temporarily or permanently establish a connexion with the human body, profitable to themselves and more or less injurious to their host. The body is prepared to deal with animal parasites in several ways. The first provision for natural resistance which epizootic parasites encounter is unsuitability of habitat which constitutes immunity. The surface of the body in the enjoyment of perfect hygienic attention does not harbour animal parasites, unless as passing visitors, because it could not nourish or support them. Failure of this provision occurs in consequence of want of cleanliness in the infirm, the helpless and the careless.

No doubt endless numbers of the lower classes of animals enter the alimentary canal, only to perish of starvation from unsuitability of the locality, to be destroyed by the digestive and other vital processes, or to be expelled with the fæces. Some of them however survive all these dangers, and establish a biological connexion with man which is advantageous to themselves and to their kind. These are the parasitic entozoa. Apparently the connexion between man and parasite has originated by a process of natural selection and adaptation on the part of the latter. The parasitic entozoon is an animal which has succeeded in evading the different provisions for protection which have just been mentioned. Indeed it has done more than this. It is so constituted as not only to escape those dangers, but actually to make use of them for its own advantage as an invader and settler. The ova of the trichina and ascaris are not destroyed but hatched by the gastric juice. The movements of the intestine do not expel the tænia, but are the means of starting the proglottides on their course outside the body which effects dissemination of

the parasite. Taken thus at an unfair disadvantage, as it were, the body is peculiarly helpless in the presence of internal parasites. Their very existence postulates the necessity of preventive and remedial measures against them.

When established within the body, animal parasites are of great pathological interest as an instance of the cause and the disease being identical. Fortunately the life history of some of them and the period of their residence within the body are definitely limited, as in the guinea-worm, the cause of disease coming to a spontaneous end.[1] This aspect of parasiticism will be noticed under Pathological Indications, when the recuperative processes to which they give rise, particularly inflammation, come to be discussed.

Indications for Treatment—Preventive and Remedial.—(*a*) The direct measures for dealing with animal parasites include in the first place the destruction of them outside the body. We kill them in the various media which they affect, particularly by sufficient cooking of food. If they haunt the surface of the skin we employ a variety of familiar parasiticides; if the alimentary canal, we order vermicides. Unfortunately we possess no medicinal means of attacking parasites successfully in the tissues—for example, the hydatid, trichina, and filaria; unless a chemical poison can be conveyed locally where they happen to be situated, as iodine has been injected into hydatid of the liver. Under these and some other circumstances, removal of the parasite has to be practised. This is effected by surgical methods in the case of hydatids: whilst worms may be expelled from the alimentary canal by means of vermifuges, which are believed to act upon them temporarily and thus weaken them so much that they are swept out by the peristalsis of the bowel.

(*b*) Indirectly parasites are to be met, in accordance with the previous considerations, by avoiding infected or suspicious food of every kind, such as uncooked vegetables (salads, water-cress); by maintaining a strict censorship of meat; by shunning the common sources of contagion, for example, domestic animals; and by sanitary measures directed against filth, particularly public baths. Children, aged persons, and

[1] Manson, "Tropical Diseases," London, 1898, p. 517.

sick or otherwise helpless individuals must be faithfully protected from the danger of parasitic infection.

Poisons.

Let us now examine one of the simplest kinds of pathogenetic causes, namely poisons. Poisons also constitute a definite class; and both their morbid effects and the ways in which the body attempts to meet them are well understood. Unfortunately, however, the body appears to present but little natural resistance to poisons as such. Indeed poisons (including drugs) are characterised by the readiness with which they disturb the body and produce what are called "physiological actions," that is, pathological actions from our present point of view. These actions are of endless variety, and are the proper subject of the sciences of pharmacology and toxicology; and it must not be forgotten that when persistent they may end in peculiarly insidious, profound and hopeless pathological changes, such as arterio-sclerosis, hepatic cirrhosis, and nephritis. The chief natural protection against poisons is instinctive avoidance of them, which is highly developed in the lower animals. Intelligence takes the place of this in man; but is unhappily over-ridden in a vast number of instances by the appetites and by evil habits which grow out of them and inherited disposition (predisposition), in the form of weakness of will or self-control. Thus alcoholism, morphinism, and the other habits of chronic self-poisoning arise.

Poisons, when they have entered the body, in a small number of instances are spontaneously removed from it by vomiting or by purging. Much more often, however, they are not; indeed some of the commonest and most powerful poisons, such as opium, paralyse the stomach and bowels and make natural recovery impossible. Ultimately poisons are eliminated from the body, unchanged or changed, by the kidneys, lungs, skin or bowels.[1] If elimination were not effected, some poisons once admitted into the blood would continue to circulate in it and to persistently produce their specific actions

[1] Barlow, *Med. Chron.*, Manchester, 1892-93, vol. xvii. p. 215.

on the tissues. This result occurs in connexion with opium when the kidneys are diseased. Unfortunately, also, poisons may injure the organs which remove them from the body—the bowel for instance in the case of arsenic, the kidneys in the case of terebinthinate and other drugs.

Indications for Treatment—Preventive and Remedial.—It is evident from the most superficial review of poisons that they must be interfered with as a class of causes of disease, and that we possess abundant opportunities and means of doing so.

(*a*) In the first place we can deal with poisons directly. We destroy noxious animals and plants. We arrest the entrance of poisons into the body; and when they have entered the body the first object which presents itself to us is to remove them. Poisons of most kinds are removed from the stomach by means of an emetic or the stomach pump, and what may have passed beyond the pylorus is pursued with a purgative. In other instances the poison is immediately destroyed as such, *in situ*, with a direct antidote: ammonia with vinegar, corrosive acids with soda or lime, arsenic with iron, lead with a drink containing sulphuric acid, strychnine with charcoal. If either or both of these methods fail, we counteract or antagonise the toxic cause when it has passed into the blood and tissues. We possess no means of destroying morphine within the tissues; we therefore administer a hypodermic injection of atropine, and stimulate the nervous system by continual movement. This is to employ a physiological antidote or antagonist to counteract it. In the same way we correct, as we say, the irritant effect of certain purgatives by carefully planned combinations of them with carminatives and antispasmodics. Unfortunately physiological antagonism has not fulfilled the expectations of its practical applications which were raised so freely twenty years ago. We have very few means of a really useful kind of anticipating in this way the pathogenetic actions of poisons. Another method then remains to be employed, namely, elimination. The bowels and kidneys are stimulated to active excretion. Some substance is given which shall combine chemically with the poison and carry it out of the system—such as iodide

of potassium in plumbism. In this connexion we appreciate how important it is that the soundness of the kidneys should always be ascertained and reckoned with in the administration of morphine, and how cautiously this and other toxic agents have to be prescribed in Bright's disease.

The rapidity with which most poisons act and pass through the system impresses on us the necessity of dealing with them *without delay.*

(*b*) In the second place, we deal with poisons indirectly—by attending to the person exposed to them. We constantly keep before us in our daily practice the predisposition or, more correctly, the liability of children to poisoning by certain drugs such as morphine, and the danger connected with the renal inadequacy of age and of Bright's disease. The disposition to alcoholism in a family is a subject of great concern to the practitioner when he is ordering treatment, or giving advice on the subject of occupation, to one of its members. We discover that some persons have idiosyncrasies towards drugs or towards particular drugs, and we make allowance accordingly. On the contrary, such poisons as belladonna, chloral hydrate and arsenic are better tolerated in childhood. Tolerance of noxious influences also may be established, and the tobacco, morphine, chloral, cocaine and other habits acquired, so that large doses have to be given medicinally to persons so addicted.

Of far greater importance however, because of so much wider application, is it to avoid those poisons to which we are daily exposed when they are employed as drugs or articles of food in safe amounts—such as opium and the many other medicines labelled "poison," alcohol and tobacco. One of the most important applications of the principle of avoidance of a pathogenetic cause relates to those persons who are or might be unable from moral weakness to protect themselves against the temptations of excess in drinking, morphinism and the chloral habit. We caution them to practise self-control and temperance; for to reduce a cause of disease to an amount which is not unwholesome is to avoid it as far as it is a cause at all. We persuade them to shun or to give up occupations which would expose them to constant temptations. If these

persons fail in the effort, we go further. We insist on their absolute withdrawal from the toxic influence. We provide "refuges," "retreats," or asylums of safety against the possibility of abuse. Besides these extreme measures, there are different kinds of "leagues," "pledges," associations and laws, all intended to assist the individual in various degrees and in various ways to shun the evil influence. There are many men who find it far easier to give up tobacco and alcohol entirely for a time than to indulge moderately in them.

In a small number of instances poisons are excluded from the body by simple protection. This is practised in manufactories of chemical poisons: white lead for example is excluded by the use of proper respirators.

Unsuitable Food.

Very closely allied to the three classes of causes which we have just examined is unsuitable food, that is, food unfit for consumption; micro-organisms and their products, parasites, and poisons developed by decomposition and disturbances of the chemical processes of digestion being in many instances the efficient causes at work. Food and feeding are accountable for a number of diseases, particularly diseases of the alimentary canal; and this in spite of the fact that the body possesses provisions for preventing them. In the first place, food that is unsuitable because of its quality, kind, form or condition often so offends the senses—the smell and taste in particular, and possibly the sight—that it is avoided. The lower animals have this guiding instinct highly developed. Satiety, passing on to loathing, regulates the amount of food which the healthy body can safely and profitably dispose of. We find, however, that these provisions are insufficient in man. It would appear that he has spoiled them by deliberate inattention to them, or by disregard of their promptings. A large number of the disorders of the alimentary system are caused by indulgence in unnecessarily and therefore unnaturally large and rich meals, and very often in food which whilst pleasant is unsuitable and unwholesome in kind. Indeed one of the objects of the art of high-class cookery is to compel appetite or at

least relish, and by means of an attractive and well-arranged *menu* to overcome the natural sense of repletion and satiety which follows the consumption of a sufficient amount of food for the bodily wants. Excess in feeding may be absolute, that is, entirely unreasonable; more often, we may trust, it is relative, that is, more than the individual can enjoy with safety in consequence of some kind of personal disability. Lack of self-control also acts as a predisposing circumstance, the appetite or inclination of the moment overcoming one's better judgment and good resolutions.

When it has entered the body, unsuitable food is automatically rejected or removed by vomiting or purgation. This is sometimes the fate of simple excess of food; more often of poisonous or otherwise irritant ingesta. Unfortunately, this provision also often fails us. Most people not only eat and drink but retain more than is necessary, and very much that disagrees with them and deranges the alimentary, assimilative, metabolic and excretory systems by being unsuitable in quality. Hepatic disorders, gout, gravel and their serious associations and consequences, such as arterio-sclerosis and nephritis, may be traced back in many instances to relatively or absolutely unsuitable food. In other instances, vomiting and diarrhœa, invaluable automatic means as they are of removing unsuitable food and other dangerous ingesta from the alimentary canal, are so severely and persistently exercised that they reduce the sufferer to a state of collapse and may even prove fatal of themselves.

These results would be met with much more frequently than is the case were it not for the capacity or wide range of reaction which is possessed by the digestive organs, as well as by the liver and kidneys, and enables them to meet the demands of excess. As we possess stronger muscles than we ordinarily use, so our digestive and assimilative organs can occasionally deal with an unnecessarily large meal. The stomach, like other organs, also responds in due proportion to unusually *small* demands for action without suffering harm. We can submit to diminished diet, and for a time even to complete abstinence, without damage to the function or structure of the digestive organs. Yet this graduated *reaction*

of the digestive organs often fails to meet the strain put upon them by the amount of food consumed. Acute dilatation of the stomach and even rupture have been observed to follow excessive eating and drinking. Acute gastric catarrh is a comparatively common result of over-feeding. Still more commonly digestion breaks down in consequence of the number and closeness of meals, the periodic function becoming exhausted. In some persons the strain of unsuitable food upon the stomach and associated organs is excessive only in relation to their condition: their reactive capacity has been weakened by age, previous disease or passing disability from disease. Every one knows that there are great differences between healthy individuals in respect of digestive power. On the other hand, insufficient exercise of the digestive functions by voluntary or compulsory fasting may have been carried too far for the health of these organs. Appetite and gastric activity decline under these circumstances, the stomach tending, as it were, to become obsolete. The personal factor is important in this connexion also.

Indications for Treatment—Preventive and Remedial.—A series of important indications for the prevention and remedy of disorders and diseases caused by improper food and feeding can be drawn from these considerations. In the first place, all unsound, impure, infected food must be destroyed either by the public authorities or by the private individual. The sanitary laws relating to adulteration and the sale of meat, fish and fruits, etc., the control of bakehouses and of dairies, and the supply of pure water are all strictly carried out to the great advantage of the public. It is to be feared that much less care is exercised in the household to prevent disease from causes of this order. In the second place when unsuitable food has been taken and its pathological effects are imminent or actually developed, the indication is to remove it. Vomiting is to be reinforced if spontaneous; or excited if it have not yet occurred. A smart purge (with calomel as a rule) completes the removal of the offending ingesta (see *Acute Gastric Catarrh* and *Enteric Catarrh*). In other instances, where vomiting and purging are excessive, we have to step in and calm or correct the excited, misdirected

mechanisms of removal. Fortunately these are fairly under our control, and abundant means are at our disposal to give effect to this. Difficulty chiefly lies in employing sedatives at the proper time: in determining that the removal of a gastric or intestinal irritant is complete, and that the sole cause of persistence of vomiting and diarrhœa is agitation or over-action of the mechanisms.

Simple *excess* of food, however wholesome in all respects, must be forbidden. There is little opportunity and still less power to carry out this indication in the healthy man, who will eat and drink as he pleases. Dyspeptic, gouty and calculous subjects come to us for advice, and with them the rule is imperative, as well as with many delicate, feeble and ill persons. The disposition of a patient's friends, whatever his trouble may be, is to over-feed him. The diseases in which over-feeding is indicated are but few, and will be noticed in Chapter VIII. *Insufficiency* of food calls for supplement, so that bodily nutrition may be restored and maintained. Return to ordinary diet after fasting from any cause must be accomplished gradually, lest the function of digestion, weakened by disease, should be over-taxed or the system flooded with aliment. It may be necessary to begin with predigested food; certainly with highly digestible food. Under these circumstances also the indication is to evoke digestive reaction—not only by graduated exercise, that is the administration of increasingly solid diet, but also by giving an alkaline and bitter stomachic draught shortly before meals.

An entirely different order of morbific causes may now engage our attention in our search for therapeutical principles, namely, the ordinary physical forces—mechanical violence, strain, cold and heat. As these are accountable for many injuries and diseases, so we shall find that they often prove innocuous by virtue of the delicate provisions for Natural Resistance by which they are met.

Traumata.

Against physical injury the body possesses many means of simple protection, beginning with the humble epithelial structures of the different surfaces, particularly the integuments, which develop under pressure and friction. Foreign bodies are prevented from entering the different mucous openings by more highly organised mechanisms of reflex closure and removal—nictitation, sneezing, laryngeal spasm and cough, mucous or watery fluxes, etc., and ciliary action. Higher still are the involuntary and voluntary movements of limbs and trunk by which we ward off or evade a blow.

After all, the resistance presented by the body to mechanical injury is readily broken. Automatic protection of the surface and the mechanical construction of the connective and supporting tissues, marvellously arranged as they are to bear both pressure and tension,[1] are weak compared with the physical forces around us. Wounds and other injuries are very common: and on a fine scale the mucous surfaces are being constantly damaged by foreign matters, including dust of every kind. Occasionally the mechanism of defence is at fault. Thus the function of the eyelashes is to protect the globe from irritant particles; yet a lash may fall into the conjunctival sac, or get inverted, and act as a foreign body. Here the mechanism of resistance itself actually becomes a cause of injury and disease. Laryngeal action, cough, and secretion fail in conditions of extreme exhaustion or as the result of nervous lesions; and foreign materials are thus admitted into the respiratory organs with disastrous results. Another unfortunate way in which the body suffers from derangement of the natural provisions for dealing with mechanical causes of disease is from very excess of their activity. The mechanisms for excluding and expelling irritant particles from the mucous surfaces and tracts may fall into conditions of excitement and spasm. Necessarily also the normal structure, situations and relations of parts are sometimes mainly responsible for permitting mechanical injury. Local vulnerability—defencelessness of one organ as compared with other organs, or of one part of an organ as compared

[1] Macalister, "How a Bone is Built," *Engl. Illus. Mag.*, 1883-4, p. 640.

with other parts of it—may be an affair of simple anatomy. The cornea is more delicate than other exposed organs. More frequently the fault of weakness is individual. Some persons have integuments so delicate that they cannot stand the wear and tear of daily work and exposure in healthy occupations.[1] This kind of debility is also observed in the female sex, and in childhood and certain other phases of life. In the young the tissues are delicate histologically; in old age degenerate and brittle. Constitutional weakness frequently accounts for vulnerability of tissues. It is characteristic of certain families and races, and is familiarly recognised in some of the types of tuberculous subjects. Inheritance is a powerful factor here. In other instances exposure to mechanical injury is afforded by occupations. Besides those whose work is of a laborious physical kind, indoor or outdoor, there are large numbers of operatives in factories constantly exposed to irritant dust, which makes minute breaches and other changes in the mucous membrane of the respiratory passages. Altogether we have here a large body of evidence of the effect of mechanical forces in causing injury and disease, and of the existence of many circumstances which predispose to and determine their occurrence.

Indications for Treatment—Preventive and Remedial.—(*a*) The first indication in this connexion is universally followed—to diminish as far as possible the risk of physical injury by directly controlling the causes themselves or the circumstances which favour them. Personally and publicly we employ every means of insuring our safety on the street, in travelling by land and sea, in places of amusement and by ordinary care in daily life. State regulation of trades and occupations in general has now greatly reduced the frequency of injury, disease and death from this cause, and from the effects of inhalation of dust in factories.

When mechanical injury is already inflicted on the body, it is often too late to think of removing the cause. Still this can be done in some instances. Foreign bodies are removed from the eye, ear, nose, throat, and even from the stomach, bronchi and lungs; and they are extracted from the

[1] Beattie on "Epidermolysis Bullosa," *Brit. Journ. Dermat.*, London, 1897, vol. ix. p. 301.

solid tissues. The products of pathological action which have the same effect, such as calculi, have to be similarly removed by operation from different organs.

(*b*) Indirectly we meet pathogenetic influences of a mechanical kind by strengthening and otherwise maintaining the natural provisions with which the body opposes them, especially in certain subjects, at certain ages, and under certain circumstances. Women, children, the aged, the weak, the sickly and the unsound are preserved against exposure to mechanical injuries; and these preventive measures are applied both publicly and personally. Every effort is made to repair the mechanisms of resistance when they are damaged, such as the cilia. Lastly, inasmuch as one of the gravest effects of traumata is shock, the system is fortified in anticipation of the deliberate injuries constituted by major operations. Previous to amputations and other kinds of serious surgical interference, the patient is prepared if possible by being got into a good condition, and by the administration of properly selected food, stimulants, strychnine, and of course an anæsthetic.

Mechanical Stress.

The most obvious kind of natural resistance presented by the body to mechanical stress is the simple cohesion of the tissues. This is limited in degree. Absolute excess or very magnitude of mechanical stress is very common in violent efforts and different kinds of accidents; the tissues and organs yield to it and are injured. At the same time, mechanical stress is met by muscular *reaction*, which is accurately adapted to resist or overcome it unless it be unreasonably severe. If the stress persist or be repeated frequently, hypertrophy is established, that is, functional adaptation proceeds to structural adaptation—a definite, accurate and sufficient means of resistance to strain, which will be fully considered under Pathological Indications. In spite of this, muscular reaction, whether functional or structural, has its limits as a method of resistance, and frequently fails. Mechanical stress may be either absolutely or relatively excessive in degree, and the muscle even when hypertrophied gives way or breaks down in the

face of it. Or the stress may be too sudden to permit effective adaptation of the muscular system, much less the development of hypertrophy. Acute dilatation of the heart and vessels occurs in this way. In other instances the demand on a muscle for work may not be unreasonably great or sudden in itself, but altogether excessive in relation to the individual in whom it is made, the capacity of whose muscles for reaction is weak in consequence of age, sex, previous disease or temporary disability from want of training. Whether a given muscular effort will be beneficial or injurious to a man often depends (*inter alia*) upon the circumstance of his being under or over forty. Not an uncommon cause of failure in this direction is previous abuse of the function by excessive exertion; for muscular exercise like so many other precious functions is easily indulged in to excess, and thus becomes a cause of disease. On the other hand, muscular reaction fails before strain if exercise have been neglected, rest indulged in to excess, and "condition" or "form" lost.

But nature has a further provision for not only resisting this possible cause of injury and disease but actually turning it to useful account. Mechanical stress is *counteracted* by extensibility and elasticity, which convert sudden impulses into latent force and liberate it in a uniform continuous manner. The force of the cardiac contraction is safely distributed over both systolic and diastolic times by the elasticity of the arterial walls, and a steady circulation maintained. Similarly, a considerable rise of pressure within the heart, say, the right ventricle, stretches the elastic walls, dilates the chamber, and even renders the tricuspid incompetent—an effect known as "safety-valve action," for thanks to it, disastrous effects of strain on the heart and lungs are prevented in severe exertion.[1] But elasticity like muscular reaction and cohesion may be, and often is, overtaxed. Whether absolutely or relatively (*i.e.* from individual weakness) elastic tissues and organs may fail to stand a severe, protracted or closely repeated strain; the elastic fibres are over-stretched, and the property of recoil is weakened or destroyed. Many of the hollow viscera thus fall into a diseased condition of permanent dilatation. "The

[1] T. W. King, *Guy's Hosp. Rep.*, London, 1837, vol. ii. p. 104, and 1841, vol. ii. p. 39.

onset of what may be called physiological arterio-sclerosis depends, in the first place, upon the quality of arterial tissue (vital rubber) which the individual has inherited, and secondly upon the amount of wear and tear to which he has subjected it." [1]

Indications for Treatment—Preventive and Remedial.—This study of the provisions which the body possesses for meeting the mechanical forces of weight and internal pressure, when they threaten to damage it, particularly muscular reaction with its remarkably accurate adaptation to circumstances, furnishes us with therapeutic suggestions of the highest order of importance. In the first place we learn that the mechanical stresses which fall upon the different parts of the body in the ordinary occupations and exercises of daily life are to be openly faced. We advise the man who has to live by the labour of his hands to meet the danger of excessive effort by well regulated exercise, combined with careful attention to nourishment and hygiene generally. By pursuing this plan he will not only be able to perform with safety and enjoyment all mechanical work of ordinary degree and reasonable duration, but he will be prepared by the training of his muscles—cultivation of their capacity for reaction—to meet safely the severe strains to which he may be exposed at any time. Ordinary labouring occupations in the open air are universally regarded as the most healthy life that a man can follow. They are the most primitive of all occupations; and they afford the most obvious of all instances of the automatic development, improvement or cultivation of a function by use. Strict attention to nutrition in the fullest sense of the term must accompany this method of fitting the body to resist disease. At the same time it is recognised that the limits of muscular capacity must be respected; and that certain classes of persons —the child, the aged, the female sex, the unhealthy, and individuals who cannot be described otherwise than as being delicate—are relatively unfit to bear the strain which an average man enjoys to meet. In such persons the indication is *graduated exercise* — to cultivate by the art of training a higher range of muscular reaction. The last

[1] Osler, "Principles and Practice of Medicine," 3rd ed. p. 770.

indication for dealing with mechanical stress as a cause of injury and disease is to avoid it. This must be done by every one when it is absolutely excessive. The difficulty is to estimate relative strain, that is physical strain in relation to the individual person or individual organ—heart, vessel, bowels, bladder. After all, a large number of individuals come under the care of the practitioner who are unable to meet ordinary or even less than ordinary influences of a mechanical kind. The heart, the vessels, the lungs, the muscles of the trunk or limbs, or some other muscular structures are the seat of disease or injury or of permanent disablement. If these persons are to be kept alive and well, we must bring down mechanical work to the level of their capacity (that is, their incapacity) since their organs cannot rise to the work without risk of failure and damage. We adjust the circumstances to the individual, not the individual to the circumstances as we do in training. The practitioner observes this indication for the prevention of disease when assisting the parents of a child that is delicate, or the subject, say, of valvular disease of the heart, to plan his future career. An easy profession is chosen for him, such as art for instance—which shall involve but little mechanical exertion, moderate hours of work and hygienic surroundings. The extent of his play and the kinds of sport in which he may indulge with safety and advantage are definitely discussed and settled, insufficiency as well as excess being faithfully avoided. This is a crude instance of the application of the principles on which mechanical strain is to be rationally prevented.

Cold.

The pathological effects of cold on the body are naturally prevented in various ways. The integuments offer a certain degree of protection from it, and this is sufficient in the hottest parts of the world where no sort of artificial covering has to be worn. Much more often clothing is required, of different degrees of warmth according to the guiding feeling of comfort associated with the sensations of temperature.

Aged persons and certain individuals have less than what might be called normal resistance to the action of cold, and thus both locally and generally their extremities readily "go dead" and they suffer from frost-bite or chilblains even in moderately mild temperatures. Other persons have soreness, swelling and chapping of the integuments or erythema or dermatitis in winter. In all such instances we regard the disability as diminution of the natural resistance. Certain occupations act as determining circumstances in this connexion.

The great mucous tract connected with respiration possesses a special provision against the cold of inspired air in the sinuses connected with the nose. When these are rendered useless by post-nasal obstruction, the bronchial and pulmonary troubles to which children are liable are probably set up in part by local chilling. In other instances the throat and bronchi are directly injured and become inflamed in consequence of the very severity of cold. At any rate it is believed that in some subjects, particularly children and the members of certain families, acute laryngitis and acute bronchitis are caused in this way, that is, independently of organisms or dust.

Whilst cold thus affects the cutaneous and mucous tracts by direct contact, it appears to produce disease in deeper parts by disturbing the body-heat. There are two provisions for preventing this pathological effect. The first of these consists in the reaction of the centres of heat-production to the influence of cold: thermogenesis. Like other physiological mechanisms, the apparatus which regulates heat-production has a wide range of activity. More heat is produced within the body as the external temperature falls, and in strict adaptation to the fall. The second provision is the more obvious mechanism of counteraction, by which loss of heat is prevented. A cold atmosphere checks perspiration, reduces the activity of the circulation through the skin, and thus reduces thermolysis. The unfavourable temperature is counteracted; the normal body-heat is preserved by a re-adjustment: the body is said to resist the pathogenetic influence and remains healthy.

There are limits, however, both to the range of reaction and to that of counteraction. If cold be extreme, the

mechanisms both of thermogenesis and thermolysis fail. Numbers of persons perish by exposure; and those who perish first are the delicate subjects as usual. The pathogeny of "catching cold" is still obscure; but a chill appears to consist in a sudden disturbance of the heat-regulating mechanism when a part of the body is exposed to cold after overheating and exertion.

In addition to these automatic methods of resisting cold, there is of course the instinctive or voluntary method of avoidance of it or escape from it by taking shelter. No doubt much disease is averted and many deaths from exposure prevented by the increased comfort which attends civilized as compared with savage life. Probably very few even of the destitute in this country die from want of shelter in winter; but many cases of catarrhal disease are aggravated if not caused by draughty, ill-built houses; and the poor suffer even more from the evil effects of over-crowding and want of ventilation which are the necessary consequences of cold.

Indications for Treatment—Preventive and Remedial.—When we attempt to formulate indications for the prevention and remedy of diseases produced by cold, we discover that it is one of the causes of disease over which we have little direct control. It might perhaps be said that when the body or a part of it has been severely chilled the cold is removed by the cautious application of heat. As a matter of fact, however, when we have to deal with cold we usually do so indirectly, that is, by controlling the subject or patient threatened or already affected by it. The most easy methods to follow are simple protection—by means of clothing, and simple avoidance —by means of shelter or removal to a milder climate. These methods are indicated in persons who are delicate in respect of age, sex, constitution, recognised liabilities to particular diseases such as tuberculosis and catarrhs, or actual unsoundness; and with due regard to country and season. We recommend such persons to remain indoors in wet and cold days and after sun-down, to wear warm clothing, and it may be to spend the winter in the house, in their room or in bed, or even to seek a milder climate or emigrate to sub-tropical latitudes. One of the chief uses of climatic treatment is

fulfilment of this indication, in order to prevent or to mitigate disease of the lungs, bronchi, kidneys, and joints.

Another course is open to us, however, namely to increase the readiness and completeness of the reaction and counteraction of the thermic mechanisms so as to make adaptation and adjustment of the body to endure cold more accurate and of wider range. According to this method, founded on the physiological provisions just examined, we train or harden the susceptible or delicate individual to resist cold better than before, by inuring or habituating his body to degrees of increasing severity. He faces the weather, he avoids warm clothing, he spends the winter in northern latitudes. Which of the two methods is to be adopted in individual instances will depend on many circumstances which do not call for discussion in this place.

Heat.

It would appear that the human body is better fitted to endure with safety extreme degrees of heat than extreme degrees of cold, inasmuch as it is naturally unprotected. As man approaches the tropics, the sensation of heat compels him to divest himself more and more fully of garments. At the same time he instinctively avoids excessive heat, and seeks the grateful shade, whether of a natural or an artificial kind. Some individuals, however, suffer locally in spite of these precautions, exposure to the direct or reflected rays of the sun producing various disturbances or injuries of the skin. The negro is naturally protected by development of dark pigment in the integuments.

The mechanism for regulating the body-heat, which we have already examined in connexion with cold, is the great automatic provision for meeting high temperatures. In the first place, the heat-centre reacts to high atmospheric temperatures by checking thermogenesis; in the second place, it counteracts the effects of excessive heat by increasing the activity of refrigeration—flushing, acceleration of the circulation through the skin, and free perspiration. Active and ever ready though it be, this mechanism is limited in its range,

and breaks down in the face of altogether extreme temperatures; and insolation is the result. Excessive heat destroys a number of lives in some countries every hot season. In other instances heat-control is deranged from within, and hyperpyrexia is the result.

Indications for Treatment—Preventive and Remedial.—The indications to be drawn from these considerations are very obvious. Persons exposed to great heat in the tropics or sub-tropics and during the warm season in temperate climates have to dress lightly; to protect themselves from the direct rays of the sun; and to provide means of artificial refrigeration of their houses. If in spite of these precautions or from some personal or other circumstance they are unable to stand the heat of the climate, they must leave it and seek a cooler atmosphere elsewhere. Similarly the nurse controls the temperature of the sick-room by attending to the fires, windows and clothing; or employs artificial refrigeration by means of ice and fanning. Instead of these passive methods of attempting to prevent the ill-effects of heat, counteraction is often practised with success. The natural process of refrigeration is brought into great activity. Some persons wear woollen garments in the tropics in order to maintain constant and free perspiration, which they say affords complete relief and maintains them in good health. Other persons resort to free exercise or even exertion when they feel overcome by heat, until profuse diaphoresis is induced. The discomfort and occasional danger, direct and indirect, attending unduly high temperatures of the sick-room may be relieved similarly by tepid sponging. Hyperpyrexia and insolation—disorders induced by heat, not simply excessive heat of the body—rationally demand refrigeration by the direct application of cold, and are successfully treated in this way.

Forms or Methods of Natural Resistance, and Indications derived from Them.

We have now examined in detail some of the principal pathogenetic influences of a simple kind, the circumstances

under which they act on the body, and particularly the ways in which the body attempts to meet them. Let us review the same facts in the reverse order, that is, under the heads of the different forms of natural resistance which we have been able to trace at work, and try to estimate the value of the suggestions which they afford for prevention and remedy. When we have done so we shall be in a position to arrive at more fundamental principles of treatment, and to formulate indications of wider application than those which we have just reached.

Destruction of the Cause.—It is instinctive in man to assail and destroy the enemies of his life and comfort, whether other man, or beast, or noxious plant or more obscure influences of an evil kind. Unfortunately ignorance and superstition long misled him as to the nature of the causes of disease, diverting his attention and efforts from the natural especially to the supernatural. All this time, it now appears, a powerful army of phagocytes within his tissues was fighting actively some of the worst of his real enemies. Phagocytosis is of great interest to the general therapeutist. It is perfect as an instance of natural resistance by direct and active conflict with the *causa efficiens* of disease. It furnishes a proof of the existence of a physiological or biological basis of therapeutics: that *the individual cell* possesses and exercises a function of self-defence and self-preservation by actively assailing pathogenetic influences with the object and effect of destroying them. It enables us to conclude that destruction of the cause of disease, both within and without the body, is a fundamental indication for treatment. It further teaches us that in some instances the body may be safely left to deal with pathogenetic influences itself.

Unfortunately, however, we have also seen that there is a limit to the capacity of the automatic efforts of the body in this direction. When micro-organisms are virulent, numerous, or of a new kind, they defeat the phagocytes, which either are overwhelmed on their own ground, or decline the encounter (negative chemiotaxis) and lose the battle by default. In other instances there can be but little doubt that the cause of failure—the origin of disease—lies with the phagocytes them-

selves, and consists in some inherent or acquired weakness of constitution. A supplementary indication is therefore to be drawn—that the natural provisions possessed by the body for assailing and destroying the causes of disease are to be maintained and assisted when relatively or absolutely weak.

Removal of Pathogenetic Influences.—Along with methods of active assault we have discovered that the body is provided with mechanisms that enable it to resist the causes of disease by active removal of them. Ciliary action, nictitation, weeping, sneezing, cough and expectoration, vomiting and simple diarrhœa have this effect in many instances. Instinctively we pluck a thorn or an arrow from a wound, and suck or wash the injured spot; instinctively we brush a noisome creature from the body. When morbific influences, organised or simply toxic, have entered the tissues they are removed by phagocytosis, and finally eliminated from the system by the kidneys, bowels, or other organs of excretion, changed or unchanged.

These provisions are, from their very nature and the opportunities presented to them, of but limited range compared with the causes of disease, many of which cannot be reached in this way, whilst others, including metallic dust and micro-organisms, are often too abundant to be all successfully removed from the respiratory passages. The elaborate and delicate mechanisms concerned in this protective function are also very frequently the seat of disease themselves, and thus are incapacitated.

Moreover, they are peculiarly liable to become deranged when severely taxed, falling into states of spasm and over-action in other ways, so that they prove an additional source of distress or even danger instead of relief and recovery. Vomiting, diarrhœa, and cough originating as physiological acts for the removal of an irritant, very often become excessive and uncontrollable from perversion of their mechanisms, continuing long after their salutary effect has been completed, and exhausting the patient. In other instances these sensitive and ever-ready mechanisms are excited by irritations originating within themselves or (reflexly) in other parts of the body and of course quite irremovable by them. In this way cough,

diarrhœa, and especially vomiting may be of purely cerebral or reflex origin, and prove a source of great discomfort or even danger to life. It is plain, therefore, that whilst we copy the natural method of removal of the causes of disease, and encourage *and maintain the mechanisms* by which it is effected in the body, we have to exercise strict control of these, lest they become inordinate and positively hurtful in their actions.

Avoidance of the Cause: Flight.—Flight is one of the most useful provisions possessed by animals and man for preserving life and health, that is, for escaping death, injury and disease. We avoid or shun dangers of every kind. Strictly speaking, flight is not resistance, but the opposite; yet it has to be considered along with resistance, inasmuch as it is one of the means by which the struggle for existence and for health is maintained, and by which survival and well-being are secured. Besides voluntary and instinctive acts of avoidance of danger to life and health, it is curious and interesting to have found an instance of this method in one of the elements of phagocytosis, namely, negative chemiotaxis. It is therefore a radical indication to avoid the causes of disease.

There appear to be at least three principal sources of weakness in this natural provision for the prevention of disease. In the first place, the nature and relations of the unfavourable influences may be such—extreme heat, extreme cold, widely distributed contagion, for example—that they cannot be avoided except by a few. Only an insignificant proportion of a population can afford to seek relief from the causes of catarrhs by migrating to a milder climate in winter, or even to leave a district infected by malaria or stricken with fever. The majority of a community must remain and run the risk in a visitation of diphtheria, plague or cholera. Secondly, natural, instinctive, or even intelligent avoidance of certain dangerous influences is often over-borne by perverted appetites. Many disorders and diseases originate in failure to avoid excess of food, alcohol, exercise, amusement, rest and pleasure of every kind, which are wholesome only as long as they are enjoyed in moderation. Man has gone even further, and perverted this natural provision for preventing excess, as we saw in connexion with cookery. Thirdly, avoidance

fails in some instances as a principle of prevention by being essentially weak and cowardly. Evasion is opposed to the open, frank, aggressive kinds of resistance which we have studied, namely destruction, reaction, and removal. It tends to weaken these, and the courage which accompanies them and grows by the cultivation of them. In man indiscriminate flight from an advancing epidemic is often an evidence of demoralization, originating in fear, degenerating into panic, and ending in spread instead of arrest of disease, as well as laying each timorous individual more open to attack. Such a step is successful only when it is organised and carried out deliberately.

An interesting mode of avoiding the causes of disease that calls for mention is *diversion or distraction.* We shall see later under the head of Nervous Influences as means of treatment how important it is in the circumstances to which we have just referred to divert the inclinations of the patient, or more correctly of the victim of feeble moral resistance, and by these means to strengthen his resolution in the direction of self-control. Just as a child that has obtained possession of a knife is persuaded to give it up, and so prevented from cutting its fingers, by offering it something more attractive but perfectly safe, so may the timely suggestion of wholesome amusement or other pursuit, travel, and especially exercise, save a man from bodily and mental disorder and disease. Diversion is indicated as a method of avoiding the causes of disease.

Passive Defence: Protection.—The most simple form of natural resistance which we have found the body to exercise in the presence of morbific influences is passive defence or self-protection. It is resistance of the same kind as an ironclad ship or a man in armour might offer to an enemy, or such as a town presents when it raises a wall about itself and closes its gates against invaders. It is a purely defensive not offensive provision in the face of danger.

Under this head fall the many means of simple protection against physical injury possessed by the body, beginning with the integuments; the different mechanisms which guard the mucous openings and other delicate and vital parts; the in-

voluntary movements by which a blow is averted, and which are an insensible step toward a higher order of defensive provisions—intelligent deliberate acts of self-protection in response to sensations of an elementary kind, such as protecting the body against extremes of heat and cold. Besides these obvious mechanisms we have seen that there resides in the tissues themselves a means, still obscure, of passively protecting the individual cells—immunity. This is acquired in many instances, particularly as the result of an attack of acute specific disease, which protects the body against another attack or renders it refractory to it; possibly immunity to some diseases exists by inherent (inherited) vitality in every individual who is perfectly healthy or constitutionally sound. We conclude, then, that it is a thoroughly scientific principle to protect the body against causes of disease, and to maintain the different provisions for defence in an active efficient state. "Life," said Napoleon, "is a fortress. . . . Why throw obstacles in the way of its defence? Its own means are superior to all the apparatus of your laboratories."[1]

We have found, however, that simple defence is often insufficient to meet pathogenetic influences. To begin with, it is purely passive and thus essentially weak. The body as a whole and its different parts offer but a feeble defence against the great physical forces of nature—mechanical, chemical and thermic. Many organs are so delicate that in spite of special mechanisms of protection they are easily wounded; and these very mechanisms of protection, like the cilia and the larynx, may break down, may cause disease instead of preventing it, or may fall into conditions of dangerous irritability constituting further disorder. Immunity fails in many instances. Personal proclivity, constitutional delicacy, racial susceptibility are all real conditions, constituting insufficiency of defence; and age, sex, certain phases of life and physiological activity, emotional depression, visceral unsoundness, and local damage by previous injury or disease all indirectly assist morbific influences in this way.

Adaptation. — In our review of the efficient causes of disease we discovered that the body possesses provisions for

[1] Emerson "Representative Men," Eversley edition, London, 1888, p. 445.

encountering certain causes of disease that cannot be dealt with by the summary methods already considered. There are influences around us against which passive defence is often vain, and which we may be able neither to avoid, remove, nor destroy. How is the body to meet the great physical forces—weight, strain, heat and cold—when they threaten to be pathogenetic? We have discovered two allied provisions for this end: adaptation and adjustment.

Adaptation is the remarkable capacity possessed by the cells, the several organs, and the body as a whole, of reacting accurately to the specific demand made upon them, and thus of adapting themselves to circumstances whether ordinary or extraordinary. Every vital act of the healthy body is in the broadest sense a *re*-action, and is exactly proportioned to the influence or influences, however variable, obscure and complex, calling it forth. The physiological adaptation of the voluntary muscles, the involuntary muscular structures, the secreting organs and the thermogenetic centre, for example, is so highly developed in range and exactness that they can work at high pressure or at low pressure (of course within reasonable limits), displaying more energy or less energy, in accurate relation to the demand made upon them. In other words, all the bodily organs have a wide range of working capacity, or (to put it anatomically) possess a reserve of force-producing tissue. This reserve is employed to meet the calls of influences above the ordinary; or, from our present standpoint, to meet extraordinary demands which threaten to be causes of disease. We escape disorder and disease from unusual exertion, large eating, and other liberties taken with our functions, by possessing more muscle, more heart, more lung, more stomach, and a heat-producing mechanism of wider range, than we habitually employ, yet displaying only as much as is required. We climb hills, live freely, undergo cerebral strain and are exposed to extremes of heat and cold when occasion demands, yet we remain healthy. Indeed we rise to an increase of work and responsibility with positive enjoyment. Let it be carefully observed, too, that this provision enables the organs to respond to *minus* as well as to *plus* influences without falling out of condition from inactivity. This capacity of our organs and

tissues for adaptation through a wide range, downwards and upwards, appears to reside ultimately in the cell.[1]

Flexible as it is and wide in scope, adaptation frequently fails to meet morbific influences in such a manner as to maintain health. The demand for energy (active or potential) is often altogether excessive, or too prolonged, or too suddenly made, or too frequently repeated. There are obvious limits to the mechanical strain which the muscles or the heart will bear; to the production of heat in the presence of intense cold; there is a limit even to the functional capacity of that marvellously adaptive and tolerant organ the stomach! And so it is with the other viscera. The disorders of digestion also illustrate the inability of an organ to resist the morbific effect of repeated stimulation at short intervals, although new powers in this direction may be acquired by habit, which is essentially a process of training in new adaptations. On the other hand, adaptation may become impaired, and disorder or disease be set up, by insufficient demands on an organ. Muscles, nerves, heart, digestive organs are well known to fall out of "form," condition, and health by want of use beyond a certain degree, from absence of exercise, shortness of exercise, or infrequency of exercise. They tend to become obsolete. In these instances adaptation breaks down in consequence of absolute excess or absolute deficiency, respectively, of the extrinsic influence.

In another class of instances, as we have also seen, the excess or defect is not absolute but relative, the disability being intrinsic. Muscular exertion is very differently borne at different ages. Certain foods agree or disagree according as they are eaten by boys, or men, or particular individuals who acknowledge their personal peculiarities in this direction. Every one recognises that there are great differences between healthy individuals in respect of the amount of exercise of lungs, heart or brain which they can take with safety and advantage. The capacity of reaction also may be weak in consequence of previous disease, permanent disablement, or temporary debility. On the other hand, some persons suffer more than others from deficient work of brain and muscles. In a word,

[1] Bizzozero, *Brit. Med. Journ.*, London 1894, vol. i. p. 732.

the faculty of reaction is of different completeness, extent and accuracy in different individuals and under different circumstances; and the liability to disorder or disease from exertion, indulgence and other kinds of excess, or from inertia, varies accordingly.

We are now in a position to state more fully the indication for treatment derived from a consideration of physiological adaptation: to turn to full advantage the natural power of adaptation possessed by the body: on the one hand, promoting its accuracy and range (capacity) by exercise and general hygiene (training); on the other hand, sparing and relieving it by modifying influences that tax it unreasonably or to excess, and particularly in certain subjects and under certain circumstances. It is true of all our functions, that in order to prevent failure under the strain of extraordinary and indeed of ordinary efforts we must maintain or restore, as the case may be, in our organs that reserve of power, that capacity (and if necessary that degree of hypertrophy) which they possess. This principle applies most familiarly to the muscles and muscular exercise, but it is equally correct generally. The digestive function, enfeebled by want of exercise begotten by the administration of artificial digestants and predigested food prescribed in routine practice or unduly continued in convalescence, is restored by being exercised on proper meals. We overcome inertia of the bowels not by rest nor by occasional violent purges which artificially relieve them of their duty, but by regular daily solicitation, by leaving a residue undischarged to serve as a normal stimulus, and by re-establishment of habit.[1] The same indication is followed in the education and management of the nervous system. The exercises of childhood and youth promote not only muscular vigour, but readiness, accuracy and completeness of co-ordination, judgment, resource, coolness and courage.[2] And it need hardly be observed that the same principles are best observed in moral as well as in physical training.

Having reached this important indication, we may profitably compare it with those which immediately preceded it, namely,

[1] Andrew Clark, *Lancet*, London, 1887, vol. i. p. 1.
[2] Treves, "Physical Education," p. 21.

to protect the body against the causes of disease and injury, and to avoid them, especially in certain delicate individuals. We find that we have before us a difficult problem in preventive and remedial treatment. Is delicacy of constitution, in respect of cold, mechanical effort, strain, etc., to be met by adaptation and hardening — exercise and exposure for instance; or by what may be called coddling—protection from the weather and comparative rest? Is natural reaction to be strengthened, or is artificial protection (known as "care") to be substituted? This question can only be answered profitably in respect of each person individually. There is here endless opportunity for the exercise of judgment on the part of the practitioner; and a knowledge of personal and family constitution, of the infirmities peculiar to different ages and to the two sexes, of mental disposition, of occupation and prospects—knowledge possessed in large measure by the family practitioner—counts for much. However difficult it may be to decide which of the two methods ought to be selected in individual instances, it will always be correct to promote the vigour of the body generally, by strict attention to the elementary functions of alimentation, digestion and absorption; to the great organs of elimination—the skin, kidneys and bowels; and to what might be called the ventilation of the body, namely, the provision of an abundant supply of fresh air.

Adjustment.—Adjustment is a more complex provision, met with, as we have seen, in the self-regulating mechanisms connected with different organs, which counteract, antagonise, or neutralise certain morbific influences that cannot be met by reaction or otherwise, or undo their effects on the body. By means of this provision the body is automatically adjusted to extrinsic influences with their incessant variations; and by similar means the different organs of the body, the different portions of each great system, such as the circulation, the different parts of each organ, and possibly even the individual cells, are all mutually adjusted. Such is the mechanism for regulating the loss of body-heat and meeting safely both heat and cold. The regulating mechanisms of the circulation present interesting illustrations of the difference between counter-

action and graduated re-action. When the arterial pressure rises unduly two changes occur in the cardiac action. First, the heart beats more powerfully: this is re-action; and it is adapted or tempered exactly to overcome arterial obstruction and prevent dilatation of the heart. Second, the heart beats more slowly: this is counter-action; the effect of the change being to let the arterial pressure fall sufficiently between the beats. Precisely the opposite events occur when the arterial pressure falls: the heart beats less powerfully, but at an increased rate. Again, when the left ventricle is over-distended from insufficient emptying, consequent upon parietal weakness or nervous failure, the depressor nerve of the circulation relaxes the arterial walls and relieves the intra-cardiac pressure. This is counter-action. In all instances of counter-action it is not the cause itself that is attacked but its effect: the cause is thus counteracted. Dilatation, referable to extensibility of tissues, is another instance of adjustment to excessive internal strain, and of the prevention, temporarily at least, of injury or disease.

Thus we have discovered a physiological basis for the familiar principles of counteracting, antagonising or neutralising certain causes of disease; of using antidotes to poisons, including the products of micro-organisms; and of employing medicinal and non-medicinal measures to relieve the functional disturbances which accompany disease. We have discovered, further, that one of the indications for maintaining health or preventing disease will be to secure the soundness of these mechanisms for natural adjustment which the body possesses, to promote their efficiency, and to relieve them if they are in difficulty. There is plenty of evidence that this is necessary. Counteraction as a method of natural resistance occasionally proves ineffectual; and disorder, injury or disease is the result. Counteraction may be impossible of accomplishment, so excessive or otherwise extraordinary is the morbid influence which has to be met. There is a limit to the accommodative adjustments of thermolysis. In other instances the morbid influence is too sudden for the mechanism to come into play, as we see in some cases of acute failure of the heart. Here also, as in other kinds of natural resistance,

predisposition is a potent cause of breakdown; age, habits and previous disease, for example, seriously interfering with the play of the nervous mechanisms and elasticity. There is therefore abundant need and scope for preventive and remedial interference conducted on strictly rational principles.

Summary: General Principles; Value of Ætiological Indications; Practical Applications.

Let us now make a general survey of the origin of disease, and the radical principles of treatment which it suggests. Disease originates in the actions upon the body of certain influences around and within it, in the widest sense. These influences are natural influences. Most of them are the same as those in which healthy life originates by their physiological actions on the body—food, air, and ordinary physical conditions such as weight and strain, only different in their amount, quality or degree, or in the frequency with which they affect the body. Others of them are different in kind also, "extraordinary" influences as they are called, such as poisons and micro-organisms, but still natural.

Besides causes proper (efficient causes) another factor of the ætiology of disease has to be reckoned with. Different individuals, and the same individual at different ages and under different circumstances, may be affected either favourably (physiologically) or unfavourably (pathologically) by the same influence. The body is more or less fully prepared to meet pathogenetic influences by the possession of a power or capacity of Natural Resistance. Health proves to be something more than *the state of being well*: it also consists in *a capacity for keeping well*. It is a condition of successful resistance to pathogenetic influences by the continual exercise of a number of sensitive, watchful, powerful mechanisms in the tissues and organs generally. From the simple epidermic structures to the delicate mechanisms which regulate the circulation and to the inscrutable organ of will, these constitute means or provisions for maintaining health. The physiologist regarding them from his point of view—that of the normal

functions—has named such of these provisions as particularly interest him *regulating mechanisms.* The ætiologist, approaching the same subject from the side of public health, describes the body as furnished with *automatic provisions for the prevention of disease.* The general pathologist, concerned primarily with disease, states the connexion in still other language: that *disease is the result of the failure, wholly or in part, of the natural resistance possessed by the body to pathogenetic influences.*

"Failure" suggests that the provisions for resistance, although ready, active and powerful, are still imperfect or insufficient. They often prove ineffectual in relation to the virulence, violence or severity otherwise of the cause, assisted by some determining circumstance. More frequently they are intrinsically weak (predisposition). Sometimes they miss their mark or are positively prejudicial. The frequency of failure is proved by the prevalence of disease; and by the fact that death overtakes all sooner or later. One-fourth of all persons born die before the end of their fifth year, and a far larger proportion suffer from disease and disablement short of a fatal termination. The fact, however, remains clear and unmistakable that before it does succumb to pathogenetic influences the body always brings or attempts to bring into action its self-preservative, resistant provisions.

Cardinal Conclusion.—We may state it therefore as a cardinal conclusion in connexion with the first principles of treatment: *that the body, as a whole and in each of its constituent parts, possesses and employs, with or without success, certain provisions for dealing with the causes of disease so as to prevent, arrest, or counteract disease.*

It is impossible to review the preceding considerations without being impressed with, first, the necessity or occasion for interference. Of this, indeed, there unfortunately can be no question. It is proved by the number, persistence and severity of morbific influences around us; by the unhappy results of their actions on man—suffering, misery and death; and by the fact which has transpired in the course of our enquiry that natural resistance in its different forms is far

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from sufficient by itself. Natural resistance and flight are at best but *means of struggling for existence and health;* they fall far short of insuring them.

The study of Natural Resistance, however, teaches us much more than its own inadequacy. It also impresses us with the opportunity of dealing with the causes of disease which we enjoy as sanitarians and therapeutists. Its very weaknesses and failures, if intelligently apprehended, encourage as well as stimulate the therapeutist, and teach him his true position in relation to the origin of disease, and the course which it is best for him to pursue. They offer him a second side from which he can approach the causes of disease in preventive and remedial treatment; and they thus widen the range of his control of disease. He can deal with the soil as well as with the seed, and often far more successfully. The doctrine of natural resistance and its limits and failures can be turned to good account, not only when the efficient causes of disease are known, as in the use of antiseptics, but when although known they are unassailable directly, as the tubercle bacillus still is for example; and even when they are altogether unknown, like the efficient cause of gastric ulcer. In a word, this study teaches him to throw himself into the struggle for health and existence on the side of natural resistance: and to do so first, directly, by dealing with the natural influences in which disease originates, including the circumstances which determine it; secondly, indirectly, by controlling and turning to most advantage every provision for Resistance that he can affect.

Value of Ætiological Indications.—Regarded as a whole, and as constituting one of the three great sets of guides to rational treatment, ætiological indications possess many characters of great value peculiar to themselves. In the first place they bring us to the very *fons et origo mali.* There is something unsatisfactory to the human mind in an acquaintance with disease that falls short of this; and the practical physician often feels the want acutely for instance in connexion with the management of rheumatism. Ætiological indications also compel a full study of causes. They demand an intimate knowledge, not only of the nature of the cause—

whether it be a chemical poison or a micro-organism—but in the instance of the latter an acquaintance with the whole natural history of the morbid cause, including the conditions of its origin, life and death, and of the pathological effects which it produces. From the more practical point of view ætiological indications introduce us to prophylaxis. "Prevention is better than cure." Even when disease is established, a knowledge of the cause and of the indications drawn from it may enable us to prevent a recurrence, as it does in gout. And when prevention is no longer possible, remedial treatment founded on ætiological indications is calculated to be more thorough and real than treatment founded on indications drawn from the disease that is set up. In the former case we are dealing with some influence which we often can appreciate and understand far better than a disease, something outside and independent of the body—air, water, dirt, poison: something which we can combat far more easily than we can modify the pathological process which it originates—tuberculosis, cholera, tetanus, plumbism.

These are not all the advantages afforded by correct ætiological indications. They also suggest to us to restore the natural physiological condition of the body instead of subjecting it to fresh disturbances by means of drugs. The action of medical remedies which we endeavour to obtain is too often but the action of a new set of causes on the patient's system. When we prescribe digitalis for a case of cardiac dilatation due to alcoholism, we appeal from one extrinsic cause of physiological disturbance to another. Better had it been possible to have dealt with the alcohol to begin with, and left the digitalis alone. The methodical endeavour to discover and fulfil ætiological indications is also an excellent safeguard against the unfortunate routine, into which there is so great a tendency to lapse, of "treating symptoms." Our practice is more often of this character than we believe. The ordinary clinical course to follow in the treatment of cardiac dropsy is to prescribe digitalis. The more rational method of procedure is first to ascertain the cause of the cardiac failure. If it have been exertion or privation, the comfort and attention provided in hospital speedily remove the dropsy without

any drugs, because they have removed the cause of it. Finally, treatment founded on ætiological indications proves to be comparatively successful. A study of the natural history of disease teaches us that as a rule disease ends with removal of the cause, although its effects may remain temporarily or permanently behind it.

Whilst it possesses the great advantages which we have reviewed, treatment founded on ætiological indications has a few less fortunate aspects. The causes of many diseases are unknown. The causes of many diseases when known cannot be reached by treatment—the weather for example. Many causes, when known, and even when known and within our control, have been too long at work to make ætiological indications of any practical value. Prevention comes too late. It is useless recommending temperance to the subject of advanced cirrhosis of the liver. This remark, however, happily does not apply to all disorders.

In this estimate of the value of ætiological indications it is not suggested that the importance of them is to be magnified at the expense of those founded on pathology and those founded on clinical observation. Each order has its proper place and its proper time of employment. A patient might die of scurvy whilst attention to the cause, so clearly indicated, was engaging all the resources of the practitioner.

Practical Applications of Ætiological Indications.—The directions in which these great indications are fulfilled are mainly three; and they are all daily becoming more comprehensive, more exact, and more effective.

The first direction is Public Health. (1) The Medical Officer of Health *destroys* the causes of disease by supervising food liable to be adulterated, and superintending the many matters of ordinary sanitation. (2) By attention to other matters of the same order, as well as when he isolates infected persons, he provides for *removal* of the causes of disease. (3) He enables us to *avoid* the causes of disease by proclaiming infected places and removing or diverting the healthy from them. (4) He *protects* the public against disease in carrying out the Factory Acts and the laws relating to vaccination. (5) The provision of public parks and gymnasia by the local

authorities, on his recommendation, enables him to promote and maintain at a high level that muscular and general capacity of functional *reaction* which we have found to be essential to the preservation of health. (6) Lastly, he insures observance of the regulations by which the evil effects of certain trades, for example the manufacture of white lead, may be *counteracted.* Tested by results, the principles on which Public Health is founded prove to be sound.

The second way of fulfilling the indications which we have discovered is Personal Hygiene: the maintenance of the health of the Individual by means of his own attention, as contrasted with public effort. The many causes of disease ever threatening us—unsuitable food, drink, dirt, contagion, violence, extremes of temperature, etc.—are dealt with: (1) By *destruction* of them—bad food, parasites, etc. (2) By *removal* of them—by the use of the bath, etc. (3) By *avoiding* many causes of disease by means of due care, including moral discipline —contagion, and food, tobacco and alcohol in excess. (4) By *self-protection* against them—cold, heat, malaria. (5) By *strengthening the bodily capacity* to meet them, by methods of well arranged exercise and rest, etc. (6) By *counteracting* unfavourable influences which cannot be disposed of otherwise. The good results of personal hygiene have been acknowledged in all ages. Some systems of treatment have consisted in little or nothing beyond it.

The third application of the principles which we have laid down is practised when the evil effect produced by these causes, that is disease, has already commenced. It is one of the parts of Remedial Treatment. Thus (1) we pursue the causes of disease with measures calculated to *destroy* them at every stage of their activity within the system—disinfectants, for example. (2) We *remove* foreign bodies, poisons, etc., from the body whenever practicable, and encourage their elimination. (3) We may be said to practise the *avoidance* of the causes of disease after it has been established, when we prevent auto-infection—so fruitful a manner of extension, for instance, in certain diseases of the skin; and when we caution alcoholics against drink or the subjects of gastric ulcer against solid food and exertion. All classes of causes, excepting those

which are instantaneous in their action, may be dealt with by one or other of these methods, inasmuch as they continue to exist, and ordinarily to act prejudicially within the body, along with the disease which they have produced. (4) We arrest the continued action of diphtheria within the body by *protective* antitoxin, even after the disease is established in the throat. (5) We strengthen the capacity of the body to *adapt* itself to the many demands on it inseparable from disease; and (6) we are only too often compelled to practise the method of *counter-acting* the causes of disease, that is, of neutralizing their effects by giving a variety of drugs.

Here we see the need and the place of the Medical Officer of Health and of the Practitioner respectively. The former mainly deals with the causes of disease and their media directly—with food, water, house-building, sewerage and infection. His methods relate to the community, the people collectively. On the other hand, the practitioner deals with the individual; and when his advice is given as regards the prevention of disease it is mainly with respect to fortifying the body against invasion, that is strengthening natural resistance. At the same time, it is obvious that all hygienic measures of a public kind have a similar effect: they build up a sound constitution in the race. When it comes to an actual case of disease the practitioner has still to keep before his mind the same great considerations: to maintain and otherwise assist or control the natural provisions for resistance.

CHAPTER III.

PRINCIPLES OF TREATMENT FOUNDED ON PATHOLOGY.

SEARCH FOR PATHOLOGICAL INDICATIONS.

The pathological characters of a diseased organ, the appearances which it presents on post-mortem examination or when exposed to view by a surgical operation, are the second great set of concrete facts on which rational treatment is based. A broken rib, a cirrhosed liver, a lung infiltrated with tubercle are definite existences or conditions which impress the mind of the observer, and which will rise in idea before it when the question of treatment of the disease presents itself in another instance. The cultivation of morbid anatomy and the employment of it as a guide to treatment characterize the legitimate Medicine of the present time as distinguished from the Medicine of the past and from the many systems of treatment—"homœopathic," "hydropathic" and so on—respectively, based on belief or on some single speculation or theory more or less plausible and attractive to the lay mind.

There is, however, danger to rational treatment in the disposition which readily develops in the student's mind to magnify the importance of pathological anatomy: to regard the post-mortem appearances as the whole of disease. Pathological anatomy, particularly pathological histology—of the connective tissues, of the vessels, of the cells—has frequently been represented as synonymous with Pathogeny, disregarding the great events of ætiology and clinical history, the two other factors of

the natural history of disease. The great development of pathological anatomy some thirty years ago tended to beget a certain heartlessness in treatment which has only recently been dispelled, more particularly by the simultaneous advance of bacteriology and Lister's antiseptic method. We accept the facts of morbid anatomy as furnishing one, but only one, of the orders of indications which have to guide us in planning scientific treatment. They are the truth, but not the whole truth; and, as we have already seen under ætiology, they are but the effects of causes which precede them and which are often more easily and successfully controlled.

We shall now analyse some of the more important facts of general pathology with a view to discover therapeutical indications in them. We shall do so mainly from the side of the recuperative factors of the process, which are our proper concern; but it must be clearly understood that the other factor of disease—destruction—has its own importance to us, and that the different factors are not separate in nature, as they have to be represented in the analysis, but intimately associated and blended with each other.

The pathological processes which will best serve our present purpose are the following: Inflammation, Ulceration and Necrosis; Degeneration; Hypertrophy; Atrophy; Hæmorrhage; Dilatation, and Anatomical Readjustment.

Therapeutical Study of Inflammation, Ulceration and Necrosis.

Nature of the Pathological Process.—The factors of the inflammatory process in the most comprehensive sense of the term are two: the destructive or degenerative factor, and the conservative and re-constructive factor.

The *destructive* factor is the local manifestation of the action of the irritant or harmful influence which constitutes the cause. What the causes of inflammation are we have seen sufficiently for our present purpose in our study of ætiological indications. In many instances they are micro-organisms or their products, but they are also chemical and

physical. The destructive factor consists of damage or death of the tissues in the forms of cloudy, fatty and other retrogressive or degenerative changes, molecular necrosis, ulceration, sloughing, caries, formation of sequestra, gangrene, etc.—changes associated with impairment and finally arrest of function.

The destructive actions and effects of pathogenetic influences are, of course, very different in different instances. In some instances the destructive action is so extensive, or so severe, or essentially so intense and swift, that it occupies the whole field and course of the pathological process. Such for instance are lacerations, eschars and the actions of the virulent infections of inflammatory œdema and of spreading gangrene. Or the cause may be specific in its action, like tubercle or syphilis, and directly or indirectly lead to softening of the tissues. In other kinds of inflammation there is but little intensity of destruction: degeneration represents the destructive factor, passes off, and gives place to regeneration. Fortunately in many cases there is evidence of limitation of the life-history of the cause, and this promotes recovery. Thus the organisms of acute croupous pneumonia and of typhoid fever complete the term of their activity within the body in a fairly definite number of days and weeks respectively; just as some of the grosser parasites, like the chigger, complete the cycle of their connexion with man, and the attendant inflammation ends, in a very brief time.[1]

The constitutional manifestations of the destructive factor are chiefly fever, wasting of the blood and tissues, and disturbances of the physiological actions of the viscera, produced by pain and tension locally and by absorption of the poisonous products of the different specific organisms.

The factor of inflammation which is *conservative and re-constructive* in its nature and effects consists of several different elements. The first of these is the *conservative or resistant* element; natural resistance still attempting to preserve the tissues from further injury by the pathogenetic influence which is at work. This element takes the forms of *phagocytosis*—active resistance; *immunity*—passive defence by exudates; and

[1] Manson, "Tropical Diseases," London, p. 589.

limitation of the area of destruction. The second element is *re-constructive or regenerative;* attempting to make good the damage. This takes the form of *repair* and *reproduction* of parts. The third of these elements is *removal of the products and other effects*—an attempt to restore the *status quo.* Each of these elements will have to be briefly examined in search of therapeutic principles.

Phagocytosis has been partly noticed already, in connexion with ætiological indications, as an aggressive form of natural resistance. The particulate cause of disease is assailed not only at the invasion but persistently and continuously; and its destructive actions are thus checked or arrested. Phagocytosis appears to be universal in the animal kingdom, a fact which suggests that inflammation in its rudimentary forms is independent of nerves and vessels. In the higher orders of animals, however, important vascular and circulatory changes and nervous disturbances accompany phagocytosis. Vascular dilatation and acceleration of the current (constituting vascular reaction) bring up the phagocytes to the position occupied by the invading enemy. The passive hyperæmia that follows enables the leucocytes to settle and issue through the walls by diapedesis to the aid of the tissue cells, some of which also possess phagocytic powers. Phagocytes attack, incorporate and digest the micro-organisms which they meet and master, probably destroying them by their excretory products before actual contact. Many of them perish in the attempt. The affected part becomes crowded with cells; and these and the abundant sero-fibrinous exudation give rise to the swelling, œdema, purulent infiltration, abscess or catarrh, as the case may be, which speedily manifests itself, along with pain, heat and redness referable to nervous and vascular disturbances.

Phagocytosis often fails to cope with the causes of inflammation, as might be illustrated from so many of the acute infective diseases. Micro-organisms may overwhelm the phagocytes by very numbers. If the micro-organisms or their products be peculiarly virulent, the phagocytes are believed not to attempt to encounter them, but to remain within the vessels—negative chemiotaxis. Or the original injury of the part may have

been so severe and extensive that destruction necessarily gets the upper hand. On the contrary, the phagocytes themselves may be feeble, probably from constitutional causes. In the one way or the other the conservative element is insufficient; destruction proceeds and extends; and exhaustion and death may result. On the other hand, pus-formation may be excessive; occasionally it is so great as to cause serious pressure which may be a worse condition than the original disease.[1]

Immunity.—Phagocytosis does not represent the whole of the resistant or conservative element of inflammation. The tissues continue to be protected by the method of passive defence which we studied under ætiological indications as natural immunity—a certain intrinsic vital property, activity or soundness of their substance or nutrition, or some aseptic property or constituent of the blood serum and the inflammatory exudates, which enables them to withstand the destructive factor, or is itself actively bactericidal or antitoxic. One of the functions of the vascular reaction of inflammation is to pour out increased fluid into the injured area.[2] Exudation is peculiarly abundant in virulent inflammations caused by micro-organisms, the serum apparently antagonising the microbes and their products, and thus rendering them an easy prey to the phagocytes. At the same time the serum forms a protective covering or scab to the wound.[3]

Passive defence also may be unsuccessful, by falling below the normal or ordinary. The exudation fails to resist the micro-organisms and their products. Severe effects from pathogenetic influences of even mild degree are not uncommonly seen in drunkards, diabetics, and persons viscerally unsound, when they sustain a simple wound or suffer from a simple disease, the affected parts drifting into ulceration, and constitutional disturbances developing a serious aspect. But instead of this the opposite evil is occasionally observed. The exudation is so abundant as to cause further local injury by

[1] "In this overproductiveness [of pus] Nature is cheated of her intent." Simon, "Holmes' System of Surgery," 1st Ed. vol. i. pp. 30, 31.

[2] Adami, Allbutt's "System of Medicine," vol. i. p. 76.

[3] Adami, *Ibid.*, p. 70.

interfering with the vessels, and thus increasing instead of diminishing destruction.

Limitation is the third manifestation of the strictly conservative or resistant elements of inflammation. Limitation of the field or area of activity of the destructive element is accomplished by cells and by fibrin. It is seen in the encapsulation of parasites; in the protective layer (pyogenic membrane) which often bounds an abscess; in the thickening of the cuticle at an injured part or at the seat of intermittent pressure; in coagulation attending thrombosis; in the formation of fibrotic sheaths; in adhesions; and in the establishment of a line of demarcation in gangrene. Whilst these processes from the histological point of view are of the nature of repair, the effect of them is limitation or localisation of destruction, as well as the prevention of general infection; and their structural details are specially disposed to secure this end. And this end is in some instances more than at first appears. Primarily it means a barrier to the extension of injurious agents;[1] secondarily it often means investment. The fibroid tissue around an invading host of micro-organisms not only blocks their incursions beyond the parts already occupied, that is, practically removes them from the body as long as it is maintained. It also starves their supplies of blood and air, and stifles them in their own self-destructive products.[2] Demarcation prevents extension into continuous parts; adhesion prevents extension into discontinuous parts, as is well illustrated by peritonitis.

Limitation may fail by being either defective or excessive; and sometimes it is misdirected. It fails to be established in the presence of virulent organisms; the disease then becomes "spreading," as in some kinds of ulcers, gangrene and cellulitis, and the blood becomes infected through the lymphatics or veins—septicæmia. In erysipelas an attempt at demarcation, evidenced by the elevated border, too frequently breaks down. Adhesions fail to form from a similar cause, or more often are prevented by movement as in gastric and intestinal perfora-

[1] Payne, Quain's "Dictionary," art. "Hypertrophy," vol. i. p. 905; C. T. Williams, *Ibid.*, art. "Phthisis," vol. ii. p. 405.

[2] Metchnikoff, "Inflammation," Starling's translation, p. 72.

tions. The wall of a tuberculous abscess is composed of tuberculous growth and imperfectly formed caseating tissues.[1] It must also be remembered that the substance of limiting membranes and encapsuled foci of disease consists of lowly organised material, and may break down at a later period if the general health become impaired, as in tuberculosis, setting free the contagion once more. In this connexion we appreciate one of the radical weaknesses of limitation—that it locks up within the body for an indefinite time the germs of disease, instead of ridding the system of them in the form of discharge and insuring it against reinfection. On the other hand, the limitation of inflammation secured by adhesion may be unfortunate by being excessive and causing interference with the functions of parts. Intra-peritoneal adhesions, originally of great (possibly even vital) importance in preventing perforation of the bowel, may also prevent wholesome peristalsis on which removal of infective products depends; and may ultimately lead to obstruction in a variety of ways, as well as to other less serious disturbances.

Repair is the chief manifestation of the re-constructive or regenerative factor of inflammation. Repair proceeds side by side with the destructive element, and follows it up, mending the damaged tissues. It is of inverse activity and success to the destructive factor. The check which the latter receives from phagocytosis and immunity assists repair; but repair is independent of phagocytosis, occurring in the absence of it when the injury is slight and not associated with micro-organisms. Repair is an essential property of the cell.[2] It is not an affair of vessels or of nerves, though both of these do greatly influence it,[3] but of the fixed connective tissue cells, epithelium, vascular endothelium—possibly also of leucocytes. In the case of wounds, repair is attained with different degrees of readiness and success in the forms of union by first intention, union by granulations, etc.

Reproduction or restoration of lost parts or organs is a variety of repair seen in blood vessels, certain glands, nerves,

[1] Watson Cheyne, "Treatment of Wounds, Abscesses, and Ulcers," p. 180.
[2] Bizzozero, *Brit. Med. Journ.* London, 1894, vol. i. p. 732.
[3] Bizzozero, *Ibid.*, p. 732.

muscles, and some other tissues and organs. Even transplantation is occasionally met with as a spontaneous process.[1]

The circumstances which favour repair and reproduction are chiefly: a proper supply and a proper quality of blood, which involve generous nourishment, repair of tissue waste being done with proper food only;[2] a healthy state and normal action of the nerves locally and of the central nervous system, including the organ of mind; a certain amount of rest, physically and physiologically; freedom from local irritation; cleanliness, that is, the absence or control of micro-organisms; air,[3] and heat.[4]

Repair and reproduction fail very often—in different degrees and in different ways according to circumstances. Repair may be entirely absent in the inflammations associated with virulent micro-organisms. Short of this, it is insufficient or slow when the circumstances favourable to it are variously wanting. The condition of the local circulation is often far from being conducive to anabolism: the arteries may be unsound; the venous blood is delayed in the part by posture, cold, varix, and other circumstances; exudation compresses the vessels, and so does fibrous growth, particularly in certain situations; whilst in other instances the vascular reaction is too violent. The blood may be poisoned by the products and effects of the pathogenetic cause; wasted by the drain connected with phagocytosis, exudation, elimination and repair itself; and otherwise impoverished. Wounds "do badly" in the subjects of Bright's disease, leukæmia, scurvy, glycosuria, and other debilitating conditions. Diseases of the peripheral nerves and cord prevent repair directly or indirectly (trophic effects); and depression of the mental centres appears to have a similar effect. Want of rest is one of the most common causes of imperfect repair, which is slow, incomplete, inferior in respect of the tissue-substance formed,[5] or entirely arrested, under the influence of movement, of incessant local irritation of the cells, of functional activity of the parts affected or of the body as a whole. Thus

[1] Coats, "Pathology," 1889, p. 187.
[2] Mott, Allbutt's "System of Medicine," vol. i. p. 165.
[3] Watson Cheyne, *op. cit.* p. 22.
[4] Bizzozero, *loc. cit.* p. 731.
[5] Coats, *op. cit.*, p. 474.

gastric ulcer is slow to heal as long as the presence of solid food excites the churning and propulsive movements of the stomach, permits gaseous distension with stretching and irritation of the damaged walls, and evokes the secretion of the actively digestive juice; whilst general bodily unrest is equally unfavourable to its repair. Dirt, particularly infective dirt, is the commonest and most important of all the causes of imperfect repair. Certain nervous circumstances, and personal, family and racial qualities also appear to delay healing. The tissues heal much better in the young than in the old. On the other hand, excess is common in repair, as it is in phagocytosis.[1] Of this the most familiar instance is "weak" granulations. It must also be very carefully observed that repair in a large proportion of instances is a substitution process, a process of degradation, the proper structure being replaced by common fibrous tissue. This is not a merely sentimental fault to be found with the result of repair. Fibrous tissue has many unfortunate effects on the actions and nutrition of parts independently of its being inferior histologically. Repair by fibrosis has to account for indurations, contractions (with consequent atrophy of parenchyma), scleroses, cirrhoses, closure of vessels and all its unhappy consequences, adhesions in unfortunate situations, rigidities and distortions and stenoses of valvular apparatus, opacities of the cornea, and strictures. The functions of delicate or vital organs may be ruined by this method of natural recovery, function being sacrificed to preservation of life—permanent or temporary.

The third conservative element of inflammation is *removal of the products and effects.* The micro-organisms and phagocytes that have perished in the struggle, and the structures that have been wrecked, are disposed of. It would appear that phagocytosis, repair and limitation, taken together, are a very costly or extravagant process. The leucocytes, the effusions, the plastic and proliferative elements intended to effect repair, the limiting growth—all are probably in great excess in most instances; and this excess, itself undergoing degeneration, added to the *débris* of the original tissues and the

[1] Virchow, "Transformation and Descent," *Journ. Path. and Bacteriol.*, Edin. and London, 1892, vol. i. p. 6.

micro-organisms, forms a large amount of products which have to be cleared away. This part of the inflammatory process is accomplished by the phagocytes and exudates, and by the lymphatic system and excretory organs. Familiar instances of the process are to be found in connexion with the resolution of acute pneumonia, the absorption of pleuritic effusions, the rapid disappearance of synovitis in acute rheumatism, the slow disappearance of sequestra. It is seen more obviously because more superficially in the discharge from ulcers, in desquamation, in expectoration, and in catarrhs from the different mucous surfaces. Abscesses discharge spontaneously sooner or later.

Removal of the products and effects is so often unsuccessful that it is one of the commonest ways in which inflammation follows an unfavourable course. It may fail entirely to be accomplished: pus is pent up in a cavity or under a crust or scab; tension of the retained products results; and a long train of local and constitutional consequences sets in, familiar to us in abscess urgently calling for evacuation or for drainage. Sometimes removal of the products is excessively slow, as in the case of bone. Or it may be imperfectly completed, remnants or residues being left unabsorbed, or as a putty-like or caseous stuff, or as masses of calcified material. Such residues frequently induce recurrence of disease—of which peri-typhlitis, iritis[1] and pleurisy are common illustrations. The direction taken by inflammatory products towards a free surface may be unfortunate. Pus may pass from liver or from pleura into lung; from the one lung into the other; or it may burrow or burst in dangerous directions, of which there are many instances. Before or in the course of removal, products may undergo decomposition, as we see in bronchiectasis and phthisis; they may block the passages and cause fresh disorder and disease, as is done by renal casts; or they may infect the passages *en route*, of which unfortunate result laryngeal and intestinal tuberculosis affords a familiar instance. In other cases inflammatory products are retained temporarily or permanently in the lymphatic tract, where they serve as fresh foci of disease at some future time; and

[1] B. Carter, Quain's "Dictionary," art. "Eye, Diseases of," vol. i. p. 655.

here again the secondary disease may be infective, whether acute lymphangitis or chronic tuberculosis. When they have entered the blood itself they may poison it, rapidly or slowly; and establish such morbid conditions as septicæmia, pyæmia, cachexia, anæmia, or lardaceous disease.

When the results of inflammation are completely successful no anatomical change in the affected organ that can be discerned is left behind—resolution. Even physiological impairment need not remain. In most instances, however, the effect is a degree of permanent damage or deterioration. Connective tissue of repair certainly possesses less vital resistance than the original parenchyma of the organ which has been injured and inflamed. It is left and it remains less resistant to pathogenetic influences, and may even break down if the blood become disordered or deficient, or in depressed conditions of the nervous system. Recurrence of inflammation is often to be accounted for in this way—as is seen in perityphlitis, gastric ulcer and malignant endocarditis.

The constitutional phenomena of inflammation referable to the conservative factor of the process may be referred to very briefly. The drain upon the blood, nutrition and bodily strength caused by the reparative and eliminative parts of the process is more than compensated by the increased activity of all the elementary functions which immediately attends successful healing. Albumosuria and other changes in the composition of the urine are further evidences of the activity of resolution, absorption and elimination going on. These as well as the other constitutional effects of inflammation will be discussed more fully under the head of Clinical Indications.

Indications for Remedial Treatment.—We have thus completed our rapid review of the most important facts connected with the pathology of inflammation which might be expected to furnish us with material for the discovery of therapeutical principles: the destructive factor, the conservative and regenerative factors, and the many directions in which the latter prove inefficient and therefore require assistance. We ought to be in a position now to formulate the rational indications for the treatment of inflammation.

The first indication is readily discovered: *to arrest the destructive factor of inflammation.* This is done on the one hand by combating the cause directly. We copy and promote phagocytosis. We attack the cause of the disease in the tissues with a view to its destruction or removal. On this principle the surgeon employs disinfectants and escharotics; he scrapes a tuberculous ulcer or cavity, removes scrofulous glands, abscesses and bones, and even amputates a limb in diffuse cellulitis, to sweep away the micro-organisms bodily; he applies specific drugs locally in the form of lotions, ointments, fumigations, injections; or remedies with a similar effect are given internally—quinine, mercury, salicyls, antitoxins. Parasites and malignant growths are attacked with chemical poisons or with the knife. In addition to all this, phagocytosis can be directly assisted. Measures calculated to have this effect include the local application of heat, to dilate the vessels by means of fomentations or poultices; attention to the state of the blood, particularly its plasma and leucocytes, by means of well-regulated nutrition balanced with elimination—purgatives appearing to be specially valuable in the early stage of inflammation; and stimulation of the local nerves, vessels and cells in certain cases—the action probably in part of blisters. Heat locally applied has the further action of increasing the freedom of exudation, the second natural means of resistance to the agents of destruction. Possibly serum therapeutics, when it has been more fully developed, may furnish us with artificial means of producing the same effect. On the other hand, there are instances (and stages?) of inflammation in which not heat but cold is beneficial, by controlling excessive vascular reaction and exudation.

At the same time an effort ought to be made to check the degenerative and necrotic changes to which the cause gives rise, that is, to strengthen the natural immunity of the parts. Here there is an indication for abundant nutrition, for a plentiful supply of fresh air, for reduction of katabolism by means of local rest, and perhaps for the use of iron, arsenic, cod-liver oil and other drugs which improve the quality of the blood and quicken anabolism.

The second indication to be drawn from a study of in-

flammation is *to copy and promote limitation.* It is on this principle that we attempt to establish an artificial line of demarcation in erysipelas (probably without success). More ordinarily, limitation is promoted on the same principle, and by the use of the same means, as repair, particularly by rest, to which we shall refer immediately. In other instances the indication is fulfilled by strictly refraining from meddlesome interference with the barrier that is naturally raised against absorption, for example in malignant pustule[1] and in inflamed veins and viscera.

The third leading indication is *to copy and promote repair.* The refinement and detail of surgical dressings at the present time are plain evidence of the importance and success of the highly scientific methods of locally assisting and controlling natural repair which have been founded on the facts just reviewed; and the surgeon is equally attentive to the constitutional means which he employs in the general management of his patients. He works on thoroughly rational principles. He attends to the position of the affected part with respect to freedom of circulation—particularly the return of venous blood, and to freedom from pain, irritation of the sore surface, and other kinds of nervous discomfort. By effecting these ends he promotes rest; and he employs every possible means, direct and indirect, local and general, to secure this indispensable condition. He uses antiseptic or aseptic measures with discrimination. He quickens weak germinal activity by applying stimulating lotions of silver, copper or zinc salts, or by means of blisters. On the other hand he checks exuberant growth by scraping weak granulations. He controls excessive vascular excitement with heat in the form of boric acid fomentations; with cold in many forms; with solutions of acetate or subacetate of lead; or it may be by local depletion. He orders a plentiful supply of nutritious food; abundance of fresh air; daily evacuation of the bowels; scrupulous attention to the excretory functions and condition of the skin; and cheerful mental surroundings. He makes full allowance for the age, sex, circumstances and personality of each patient. In other instances the surgeon even goes so far as to copy

[1] Greenfield, Quain's "Dictionary," art. "Pustule, Malignant," vol. ii. p. 594.

repair and reproduction in a wholesale fashion. He unites a fractured bone with pegs, wires a broken patella, transplants strips of skin. In consequence of the success which has been attained in the healing of wounds by scientific control of repair, he does not hesitate to perform surgical operations involving extensive division of parts, confident as he is that they will unite with readiness and completeness if the conditions favourable to repair are insured. Whilst he thus encourages repair, the surgeon does not forget that the result of it is sometimes unfortunate from its very excess, or from the form which it takes or the situation in which it occurs. He therefore takes precautions to prevent as far as possible the evil results of fibrous healing, including ankylosis, stricture, and opacity, by means of due regulation of rest and exercise and other devices; and he uses every effort to heal wounds and ulcers *quickly* so as to avoid the production of a quantity of weak tissue which might break down later on.

When inflammation involves an internal organ and concerns the physician, this indication is equally rational and urgent. Unhappily it cannot be fulfilled in many of its details because of the inaccessibility of the affected part; still, much more can be done to promote repair than might appear at first sight. Rest is secured—both general and local—by confinement to bed or the house, or by relief from work, in different instances as circumstances require: and by reducing functional activity—of the heart, for example, in endocarditis, of the stomach in gastric ulcer, of the chest in pleurisy. By following these principles we also control connective tissue growth and secure repair with stronger material, thus reducing the liability to subsequent breaking-down of the scar-tissue. We may even prevent the unfortunate effects of fibrosis attending the repair of internal organs or at least keep them within moderate bounds, just as the surgeon does for external parts. Respiratory exercises restore in some degree the expansion of the chest after pleurisy or in the quiescent stage of phthisis. To take another illustrative example, the favourable course of the local inflammatory process of typhoid fever is assisted by bodily rest; by rigid supervision of the diet in respect of amount and kind, so as to

favour physiological rest of the bowel whilst it is sufficiently nutritious to restore the blood and damaged tissues; and by disinfecting the foul products and preventing tympanites. Depletion and counter-irritation of parts in vascular or nervous connexion with inflamed viscera are rationally indicated in many instances, and practised with success. In these internal inflammations constitutional measures have to be employed with even greater care if possible than in external: nutrition, elimination, hygiene in the full sense of the term, and the promotion of courage and hope, whilst due respect is paid to the particular organ involved.

The fourth essential indication is *to copy and promote removal of the products and other effects of inflammation;* and to anticipate or remedy the different ways in which this provision so often fails. In obedience to this great principle the surgeon insures the evacuation of pus and sloughs by means of the knife followed by the drainage tube. In the case of serous inflammations, such as simple pleurisy, the physician usually affords nature an opportunity of spontaneous absorption, unless there be either actual urgency (in consequence of local pressure) or evidence in lapse of time that lymphatic activity is not sufficient. If pus have already begun to make its way in a wrong direction, its course may be diverted by the use of fomentations and position; or it may be reached with the knife.

So in the treatment of catarrhs of mucous tracts, the inflammatory products have to be removed by encouragement of the natural provisions for the purpose. Expectorants are employed to clear the respiratory passages in bronchitis; simple or alkaline diuretics to flush the uriniferous tubules in nephritis; a certain number of daily stools are permitted in typhoid fever. These and allied methods are variously copied in the use of injections, siphonage, posture, diuretics, laxatives, etc. Local remnants may be dispersed by massage; or by properly adjusted pressure which induces absorption and atrophy. In this connection it is important to observe that evacuation of inflammatory products by operation fulfils not only the obvious indication before us but also that radical indication to *have respect for time.* It shortens the course of

the disease; it spares the patient much suffering; it prevents exhaustion; it removes the risk of the pus taking an unfortunate direction, and of absorption of infectious products; and it affords an opportunity of seizing the most favourable occasion for relief.

In connexion with the removal of inflammatory products, it is also clear that means should be taken to strengthen the lymphatic glands and vessels, that is, to increase their activity, in persons of delicate constitution. This end is accomplished with different degrees of success by ordering life at the coast and the administration of such remedies as iodides and cod-liver oil. When the lymphatic structures are actually involved in disease, consequent on disordered absorption, special treatment will be called for.

The principle of removal of the products of inflammation is also employed in connexion with the blood into which they are poured preparatory to excretion. Some drugs, such as quinine, are believed to be of service in correcting blood-poisoning of this order; and there is a reasonable hope that certain antitoxins may yet be introduced which will be more successful in the same direction. At present most benefit is obtained by fulfilling the indication indirectly—by promoting excretion, that is, by purifying the blood with purgatives. Free daily evacuation of the bowels is desirable in all inflammatory processes; it is a *sine qua non* in the successful treatment of threatening or actual septicæmia. The other great excreting organs—the kidneys and skin, as well as the function of respiratory ventilation—require close attention at the same time. The patient is encouraged to drink water freely, the surface of the whole body is cleansed daily, and he is surrounded with the largest volume of fresh air that can be provided. These details of treatment, along with those already mentioned under previous heads—control of fever, generous feeding, the proper use of stimulants and respect for special indications (for example in scurvy, diabetes, etc.)—constitute "attention to the general health" on which successful treatment of the inflammatory process as a whole so much depends.

The effects of inflammation other than its products have

also to be removed or reduced—adhesions, strictures, ankyloses, and the like. There is here abundant opportunity for the use of massage, movements and operations of different kinds. After pleurisy with effusion, both the lung and the chest will call for an effort at expansion. More remotely, the blood and indeed the body as a whole must be recuperated after every severe local inflammation.

Therapeutical Study of Degeneration.

Degeneration is the reverse of regeneration: it is a process of retrogression or degradation of tissues to simpler constituents. The chemical and histological characters of their elements are changed, as well as the gross appearances of the organs; and in all kinds of degeneration the functions of the parts are impaired.

Origin and Nature.—Degeneration originates in interference with the nutrition of the cell. This is caused by disturbances in the quantity and quality of the blood-supply; by poisons, extrinsic and intrinsic; by interference with the removal of waste products; by disease or disorder of the nervous (trophic) centres and tracts which control cell-life; and by excessive or insufficient cellular exercise. As a rule one or more of these influences are at work in producing degeneration, and they may be regarded as the efficient causes of this pathological change. In other instances, however, and those of the most striking kind, degeneration occurs in the absence of all its recognised causes. Such are essential muscular atrophy, arterio-sclerosis in young subjects, cardiac degeneration affecting several members of a family at a comparatively early age, and some forms of renal and nervous degenerations. Another factor therefore must participate in the production of degeneration. This is predisposition, or as we have preferred to regard it in our study of ætiology, diminished resistance. When a cell degenerates, we represent the process as consisting in failure of those "essential" vital properties with which it was originally endowed at the conjugation of the sperm-cell and the germ-cell, and by virtue of

which it has been enabled hitherto to resist the many pathogenetic influences around it that are constantly threatening its nutrition.

Now the essential vitality of the cell varies greatly. It is abundant and vigorous in the young. It declines with advancing age. Senility is intimately associated with its decline; and when it is exhausted death comes. It is also very different in different individuals, families and races. When it fails to resist those influences unfavourable to the nutrition of the cell which we recognise as efficient causes of degeneration, degeneration is the result. If these are extremely powerful, such as phosphorus, diphtheria toxin, or severe anæmia, fatty degeneration occurs in spite of healthy and even vigorous vital resistance. Causes of moderate severity, such as alcohol, general anæmia or insufficient elimination, overcome the more feeble resistance offered by the ebbing vitality of senile tissues, particularly in individual persons, and in individual parts subjected to strain. In a few subjects so low is the vital resistance of the voluntary muscles, heart, arteries, ganglion-cells, etc., that it is exhausted in childhood or adult life, that is, in the presence of the events of ordinary use, and they undergo degeneration "idiopathically."

Kinds.—The principal kinds of degeneration are fatty metamorphosis, granular or parenchymatous degeneration, calcification and lardaceous disease. In fatty degeneration, which is usually associated with an insufficient supply or intake of oxygen, the deficient vitality of the cell is manifested by accumulation within its substance of one of the products of incomplete metabolism, namely oil or fat, which under normal conditions would be further decomposed into carbonic acid and water. Parenchymatous degeneration is the typical result of interference with cell-vitality by poisons, such as phosphorus (first stage), arsenic, and—most common of all—the toxins of infective processes. Calcification usually occurs in tissues already dead. In living tissues it signifies extremely low vitality. Lardaceous degeneration possesses quite a peculiar pathology.

The impairment of function which accompanies degenera-

tion may be of no serious consequence when indifferent tissues like cartilage are involved. In a second set of instances degeneration is sequential to other morbid processes, especially inflammation, in which the function of the part has been already damaged or entirely destroyed. In a third series of instances fatty degeneration is actually physiological—as is seen, for example, in the secretion of milk and the involution of the uterus *post partum*. But in the greater number of instances, as it is met with in practical medicine, degeneration affects the most important or vital organs of the body—the cardio-vascular system, the kidneys, the muscles and the brain, and directly as well as indirectly shortens life.

At first sight degeneration appears to present no element of spontaneous recovery. The essential degenerations of muscles, arteries and kidneys—different forms of premature decay—are hopeless because congenital; and so is the natural decay of advanced age. But, on the other hand, granular degeneration passes off with recovery from acute disease, and fatty degeneration from poisons and from general anæmia is no doubt often nothing more than a temporary change. In other instances local degeneration is closely accompanied by repair, as is seen in the parenchymatous tissues; and limitation by encapsulation is the ultimate result in many cases.

Indications.—We see that, after all, an enquiry into the rational indications for dealing with degeneration is neither illogical nor unpromising. The first indication is to prevent or arrest degeneration by *restoring the conditions of healthy nutrition* which are in any respect disordered. When the blood-supply is deficient in quantity we have to consider what is the nature of the anæmia. If it be general, as in fatty heart consequent on hæmorrhage, the blood must be restored. If it be local, as in fatty heart secondary to coronary disease and in fatty aorta secondary to disease of the *vasa vasorum*, an effort must be made to open the occluded vessels with iodides and allied measures. When the quality of the blood is deficient, as in chlorosis and pernicious anæmia, iron, arsenic, food and other hæmatinic measures, medicinal or non-

medicinal, are to be actively employed. It must never be forgotten that disposal of the products is essential to the health of the cell; and that elimination may be the most important part of the treatment of degeneration in some persons. When degeneration is believed to be referable to loss or perversion of an internal secretion like that of the thyroid, recognised substitutes must be given. Toxic states of the blood demand arrest of the ingestion, and quickening of the elimination, of such poisons as phosphorus, antimony, arsenic and alcohol; but this cannot always be effected in time. Toxins may be antagonised by antitoxins. Morbid intrinsic products, such as sugar, must receive proper attention. When degeneration is traced to affections of the nerves, cord or brain, or to causes that act reflexly through the nervous system, an effort must be made to remedy it through the same media. Nervous rest, sleep, change, and nervine tonics may prove serviceable under these circumstances. In this connexion we appreciate the value of insuring a sufficient amount of natural physiological stimulus to a degenerating organ, chiefly in the form of a carefully regulated and it may be graduated demand for work. Muscles, heart and nervous system in particular are benefited by properly ordered exercises when they have fallen into conditions of impaired nutrition. In a similar way certain "tonics," such as strychnine, appear to benefit metabolism; and digitalis, given in small doses for a length of time, to improve the nutrition of the myocardium. The question naturally arises whether we do not possess drugs that influence metabolism in a way which might be turned to useful account in atrophy. Arsenic and phosphorus appear certainly to belong to this category; perhaps zinc and silver, and it may be some of the vital extracts. To be of use, such drugs must be pushed until toxic effects make their appearance.[1] A promising remedy for some instances of degeneration is a combination of arsenic (to affect metabolism directly), iron (to improve the oxygenating value of the blood), and nux vomica (to quicken nervous and circulatory activity). But in every case the value of non-medicinal remedies at the same time must not be forgotten.

[1] Joseph Collins, *Am. Journ. Med. Sc.*, Phila., 1898, vol. cxvi. p. 290.

The second indication is *to reckon with the essential vitality of the affected individual,* and the specific vitality of the organ that is the seat of degeneration; that is, to reckon with any predisposition to degeneration that may exist. Inherited deficiency of vitality is beyond our power to make good; but the recognition of it in a family (with respect, for example, to degeneration of the cardio-vascular system) ought to suggest an attempt at prevention or postponement of the morbid change by the employment in the children of measures calculated to preserve the tissues from other causes of atrophy, to spare them unnecessary strain, to reduce even the ordinary demands upon them to a low but sufficient level, and to attend faithfully to their nutrition. A similar indication applies to the management of those individuals in whom vitality, originally sufficient, is becoming exhausted — in particular the aged and the bed-ridden. Great judgment is demanded to maintain and quicken vital energy and healthy metabolism in these subjects without exhausting them.

In some instances the effects of degeneration, and indeed degenerated parts themselves, can be removed with safety and advantage. Caseous and calcareous glands and various concretions are best dealt with in this way when they occupy accessible situations.

Therapeutical Study of Hypertrophy.

Pathological lesions and other disabling conditions of certain organs are accompanied by an increase of their active elements which makes up for the interference with function caused by disease. This increase of tissue is called hypertrophy: it might be called physiological repair or functional repair, in reference to its significance and effects.

We have already seen that hypertrophy may also occur as a provision for resisting certain causes of disease, that is, when disease is threatening but does not actually exist. It then prevents injury. We meet with it in this relation in the hypertrophied left ventricle of Bright's disease, which grows

in thickness with the obstruction in the peripheral vessels. The present is the best opportunity of discussing hypertrophy in all its bearings.

The most familiar illustrations of this pathological change, as regards its nature, its effects, and its failures are drawn from the heart, but a number of other organs become truly hypertrophied when a fellow organ, or a well-defined portion, such as a lobe, becomes reduced in functional value; such are the kidneys, testes, lungs and liver.

The origin of hypertrophy is to be found in certain physiological laws which are easily stated.

The first of these laws is that the functional capacity of a healthy organ exceeds its ordinary functional activity: that every healthy organ is provided with a reserve of "latent" tissue. We have already studied this subject under the head of Adaptation as a method of natural resistance. Here it is necessary only to repeat that the law is part of a greater physiological law—that all active organs possess capacity as well as activity, that is, they enjoy not only power to act, but *a range of variable action* in accurate adaptation to changes of the natural forces to which they are subject.[1] The need for this arrangement is obvious: it is a provision against emergencies. The amount of energy displayed (practically the amount of work done) at any time by an organ is in direct proportion to the call or demand made upon it. The more heavily a muscle is loaded the more powerfully does it contract, until (it need scarcely be said) a limit is reached to the possibility of this reaction.

The second law which we have to regard in this connexion is that when the reserve energy of an organ is thus evoked repeatedly or continuously for a certain length of time, the active elements increase, whether in individual size or in number, and therewith the capacity of the organ is raised. The organ is now said to be hypertrophied, its bulk or weight and its functional value both being greater than before, and this in direct relation to the addition made to its work.[2]

[1] B. Bramwell, *Brit. Med. Journ.*, London, 1888, vol. i. p. 835.

[2] For Herbert Spencer's ingenious views on the origin of Hypertrophy, see "Principles of Biology," vol. i. p. 191, and vol. ii. p. 363.

The opposite effect, the effect of diminished work, need only be mentioned in this place. See Atrophy, p. 83.

In order that hypertrophy may be originated and maintained in an organ certain conditions or circumstances are necessary. In the first place, there is the increased and reasonable demand for work from it which we have just discussed. Secondly, there must be a free supply of blood, that is of nutrient and force-yielding elements and oxygen, to the active, growing organ, inasmuch as the capacity of an organ is, after all, its capacity to convert plasma into energy. Thirdly, the nervous influences which reach it must be healthy in all respects—an expression of some indefiniteness but one which need not be elaborated in this place. Fourthly, intervals of rest must be permitted between the periods of exercise. And fifthly, the process requires time.

The results of hypertrophy are demonstrable in the organ itself and in the work which it accomplishes. An hypertrophied organ may be increased many times its ordinary weight: the heart from 10 or 12 ounces to as much as 60 ounces. The functional result is of course a gain in activity. The work which such an organ can accomplish is more usually measured by the difficulties in the face of which it maintains a healthy function than by the absolute result. Such difficulties may be conveniently named disability or inadequacy of the organ; and the effect of hypertrophy in removing disability is known as *compensation*. Disability may be absolute —that is, the organ may be damaged, diseased or otherwise imperfect, so that it cannot meet an ordinary strain without the effort that leads to hypertrophy; or it may be relative, the organ being sound and capable but called upon to react to an extraordinary strain. Thus the value of hypertrophy of the left ventricle may be estimated by the degree of narrowing of the aortic orifice, that is, the absolute cardiac disability which it compensates; or by the height of the arterial pressure which it overcomes in chronic Bright's disease, that is, the relative cardiac disability which it compensates.

As far as we know, there is no limit to the length of time for which an hypertrophied organ may continue its increased function, maintaining the fresh balance of work

demanded and force displayed—a perfect form of permanent natural recovery, provided all the circumstances are still favourable. The continuance of hypertrophy is however strictly dependent on persistence of the increased demand on the capacity of the organ. If the demand returns to the normal, the hypertrophy declines and disappears.

Failure of Hypertrophy. — Whilst it has thus no spontaneous tendency to be undone, the preservation of hypertrophy and the maintenance of compensation which it secures are being constantly threatened by the absence of one or more of what we have called its necessary conditions. The same circumstances would prevent the development of hypertrophy, that is, the establishment of compensation, or would render it at the best imperfect and precarious.

In the first place, hypertrophy cannot be established, or if established, cannot be maintained if the demand for energy be excessive. The increase of work thrown upon an organ must be reasonable, as we have already seen. Overload a muscle, and the contractions which had been of increasing magnitude with the increasing load become small and feeble and entirely cease. So with the hypertrophied heart. If the internal pressure rise beyond a particular (indeterminate) height, cardiac failure will occur, that is, failure of the ventricle to empty itself against the internal pressure; and this whether the strain be prolonged but moderate, as in cardiac dropsy, or excessive but brief, as possibly occurs in angina pectoris.

Secondly, insufficient rest is closely associated with the preceding cause of failure. If strain be continuous and the demands made on the organ (stomach, heart or vessels) be kept up without intermissions for physiological rest, there will be no physiological repair.

Thirdly, failure of an hypertrophied organ most often is a consequence of disturbance of nutrition. In cardiac enlargement, for instance, it takes place as a result of underfeeding or of unwholesome overfeeding, of the tax of bodily growth and development, of toxæmia, of hæmorrhage, or of coronary degeneration. Probably there is more liability to failure of a hypertrophied than of an ordinary organ. At any rate its nutrition must be regarded as relatively more precarious.

Wild found that the blood-supply to the hypertrophied heart is proportionally much smaller than that to the normal heart.[1]

Fourthly, unfavourable nervous influences undo compensatory hypertrophy of the heart. Depressing emotions have this effect—grief, anxiety, distress, fear and the like.

Lastly, hypertrophy may fail to be established from want of time. The cause of the demand for increased energy may be so sudden, that although by no means excessive it overwhelms the organ before the reserve force can be called into action. In traumatic rupture of the aortic valves sudden death may occur on this account, for the first factor in the mechanism of increased reaction to rise of pressure cannot always come into play with sufficient speed to accomplish the next systole, empty the ventricle, and save life. If the lesion be not positively sudden, a wonderfully short time suffices to originate hypertrophy. Bizzozero speaks of the muscle-cells of the bowel as increasing in size and in number within two days of an artificial stenosis.[2]

There are still two directions in which this method of natural recovery may miscarry. Hypertrophy is sometimes excessive: if not excessive as regards the organ which it involves, excessive as regards other or neighbouring organs or the body generally. Hypertrophy of the pylorus and of the prostate may give rise to the symptoms of disease. Tumours are occasionally the results of similar hypertrophy. According to some authorities [3] cardiac hypertrophy in valvular disease occasionally becomes excessive, and gives rise to palpitation and other distressing symptoms referable to the circulation. In Graves's disease, whatever its intimate pathology may be, we have to deal with a pathological condition in which there is an excessive display of nervo-muscular energy on the part of the heart, and an associated hypertrophy of the cardiac wall of equally wasteful effect. Hypertrophy is also occasionally misdirected. The compensating hypertrophy of the left ventricle in chronic Bright's

[1] *Med. Chron.*, Manchester, 1892, vol. xvi. p. 232.
[2] *Brit. Med. Journ.*, London, 1894, vol. i. p. 729.
[3] Foster, Quain's "Dictionary," art. "Heart, Valves of," vol. ii. p. 849.

disease, strictly beneficial in some respects, unquestionably contributes to the occurrence of cerebral hæmorrhage. The increase of cardiac tissue and of cardiac force in this instance is no doubt in due relation only to the demand for them, that is to the peripheral resistance; but the tension of the arterial system between the two extremities—the capillaries and the heart respectively—is raised to bursting point by the compensatory provision for recovery. Cerebral hæmorrhage under these circumstances is but the worst of a long series of distressing results of the high arterial pressure.

Indications.—It will be gathered from what has just been said of hypertrophy as a provision for recovery that there may be much occasion for the therapeutist to interfere with it. It frequently falls short, it may be excessive, it may be perverted in its effects; and failure of it is usually referable to purely extrinsic circumstances which suggest assistance. In other instances the necessity for it might be removed, thus saving the body a heavy and continuous demand on its reserve. The indications that follow from these considerations will now be systematically stated. The first is to *promote hypertrophy* in association with disability from disease, as an invaluable method of compensation. This indication is easily fulfilled. There are few processes of health or of disease that we can control or modify more readily or more fully than hypertrophy, or with safer guides as to when and how we ought to commence, continue and stop. It happens to be a very easy matter to find more work for organs, either of an ordinary kind or of an extraordinary kind, particularly by means of drugs, and to throw such work upon them in a graduated way—on the muscles especially, but also on the stomach, bowels, liver and brain. On the contrary we can insure rest, completely in some organs, relatively in all, vicariously in a few. Other circumstances contribute to make this a favourable opportunity for the therapeutist. He can estimate readily and accurately the amount of force required, the amount of force or of hypertrophy secured—by physical examination and the study of symptoms. He may also have an opportunity of taking advantage of this method of treatment repeatedly, for even if

hypertrophy fail, and fail again and again, he may as often restore it: it is not a desperate resource like some other methods.

Coming to details, we find, first, that to promote or restore hypertrophy, the demand for energy—the weight to be lifted, the load to be driven, the amount of material to be secreted or excreted, as the case may be—must be made reasonable. In cardiac disease and in chronic Bright's disease the pressure within the chambers of the heart may have to be lowered by such measures as purgatives, the abstraction of blood, vascular dilators and rest. An unfavourable condition by no means uncommon in connexion with failing hypertrophy of the right ventricle in mitral disease is the occurrence of pulmonary disease such as bronchitis. Removal of this handicap will have the effect of relieving the over-burdened ventricle, and indirectly maintaining the compensatory hypertrophy.

Secondly, the amount and quality of the blood supplied to the hypertrophied muscular tissue must never be forgotten in the maintenance of compensation. Food, digestion, assimilation, excretion, the supply of air, and such drugs as iron and arsenic—all these means of insuring an abundant supply of pure blood are carefully considered by the practitioner. In the case of failing hypertrophy of the heart, his difficulties in this respect are very great, inasmuch as one and all of the functions concerned in nutrition are more or less deranged by mechanical congestion. This and its many consequences (a vicious circle, commencing in the heart itself) have to be removed.

Thirdly, all unfavourable conditions of the nerves that supply the hypertrophied organ must be remedied. Depressing emotions contribute to failure of compensatory hypertrophy of the heart; and in this respect also a vicious circle is formed, which often can be broken by judicious management.

Fourthly, a sufficient amount of rest must be insured. In hypertrophy of the voluntary muscles and of portions of the alimentary tract, such as the pylorus or colon, this indication can be fulfilled without difficulty. In the case of the heart absolute rest can be secured only by lengthening diastole.

This is effected by means of such drugs as digitalis—whether directly, or through the medium of increased arterial tension which reacts upon the inhibitory mechanism of the heart. The removal of asystole is an important step towards conditions favourable to the re-establishment of hypertrophy.

Fifthly, we must afford time for hypertrophy to occur. Art has to afford nature time to bring up her reserve of force and to develop hypertrophy. This indication is fulfilled by maintaining life when it is threatened by a sudden lesion; and by sustaining strength until the conditions of hypertrophy assert their influence. Powerful stimulants will often tide the heart over such periods of peril as occur in connexion with strain or with acute cardiac debility in diphtheria and scarlet fever. Strange though it may appear at first sight, the dilatation of the chambers which occurs under these circumstances has the same useful effect—of affording temporary but very precarious relief by means of *accommodation* (see Dilatation, p. 95). The cardiac wall yields, by virtue of its extensibility, and prevents fatal rupture or paralysis; at the cost, it is true, of serious weakness, which the subsequent hypertrophy will have to compensate.

In some instances, as we have seen, hypertrophy calls for control instead of promotion. It will certainly be correct to restrain excessive hypertrophy. This indication appears to be best fulfilled by reducing to a minimum all kinds of excitement of the organ involved; and by removing the instability of the nervo-muscular mechanisms in which the excessive action that ends in hypertrophy originates by a kind of habit. Thus in irritable heart from physical strain or from degeneration we forbid tobacco and nervous excitement, as well as muscular exertion; and we give carefully planned combinations of arsenic, digitalis and possibly bromides.

Equally desirable will it be to attempt to prevent or remove the misdirected effects, direct or collateral, of hypertrophy. This indication may be fulfilled by guarding or strengthening the parts that are in danger, such as the vessels in Bright's disease with hypertrophy of the left ventricle. At the same time, the more radical method discussed under the next indication should be followed.

Another indication, and that a radical one, remains to be discussed in connexion with hypertrophy : to promote the same object by adopting the more fundamental and less expensive method of anticipating it or removing the need for it—the disability which evokes it. We regard it as better treatment to reduce the abnormal rise of peripheral resistance in chronic Bright's disease by purgation and dieting, than to leave this uncontrolled and trust to maintaining a degree of cardiac hypertrophy fit to overcome it. Treatment, in its fullest development, consists in doing both in proper relation to each other. On the same principle in the management of valvular disease of the heart, say, aortic stenosis, although organic obstruction cannot be removed, our duty is still clear—to follow the same indication indirectly by preventing any increase of it, that is, a fresh lesion at the same valves or at the mitral valve; and to reduce all related disability by lightening the pressure within the left ventricle.

Value of the Method.—The practical value of hypertrophy as a remedial method may be truthfully said to be enormous, when it is properly applied or when it is correctly appreciated in its natural manifestations. To estimate it aright we have but to regard for a moment how much hypertrophy does in heart disease and in kidney disease; or rather what the fate of the victims of these classes of disease would be without hypertrophy. So with obstructive diseases of all the muscular tracts of the body, including the alimentary canal and its associated glands, and the genito-urinary system. The assurance of hypertrophy also justifies and encourages removal of a diseased kidney, operations on one lung or one side of the chest, and the like. It must not be forgotten, however, that hypertrophy, when thus deliberately provoked, will require to be maintained, controlled, or otherwise judiciously modified, according to the indications which we have just discovered.

Therapeutical Study of Atrophy.

The subject of atrophy and the indications for the prevention, arrest or removal of it may be taken as a supple-

ment to hypertrophy. In atrophy structures are reduced in size and impaired in function under conditions which, broadly speaking, are the opposite of those leading to hypertrophy.

Origin and Nature.—Atrophy results from failure of nutrition: from deficient quantity, poverty, or impurity of the blood supplied to the part. Under this head fall also certain poisons, such as lead, alcohol, ergot and toxins, of the first importance as causes of atrophy; and pressure in part. The active tissues undergo the same pathological change in consequence of want of use. Muscular atrophy from abuse of rest is a familiar instance of this. Want or failure of nervous impulses is intimately associated or actually identical with the preceding cause. It is abundantly illustrated as a cause of atrophy in descending sclerosis and in the muscular atrophies produced by cornual disease and peripheral neuritis. In a highly interesting series of instances atrophy is referable to exhaustion of original germinal vitality. This is typically met with in idiopathic (essential) muscular atrophy, in baldness, and probably in some kinds of "family" diseases of the nervous system and heart, as we have already seen under Degeneration.

Hopeless though it might appear, atrophy is not always beyond recovery. If the cause of it be temporary, such as pressure, defective nutrition, poisons or insufficient exercise, it spontaneously disappears. And when it is permanent, it is accompanied by a recuperative process. When it involves the active parenchymatous elements of an organ it is commonly accompanied by regeneration, which takes the form of an increase of fibrous tissue and reminds us of repair in inflammation. Pseudo-hypertrophic muscular paralysis and alcoholic cirrhosis illustrate this association. Whilst this is the more common and more important relation of the two changes to each other—atrophy leading to fibrosis, it is occasionally the reverse, a slow inflammation of the connective tissue being regarded as the primary change, and the atrophy of the parenchyma as an effect of pressure and disturbed nutrition. Hence the terms "chronic interstitial inflammation," and "fibroid degeneration," the lowlier connective tissue taking the place of the higher elements of the organ.

Indications.—Although atrophy is often a physiological process—as it occurs for instance in the teeth, hair, uterus and mammary glands, skin, etc., at certain periods or phases of life; and although it is sometimes deliberately induced as a means of promoting the absorption of inflammatory residues; it concerns us more usually as a pathological event or condition calling for treatment. The general indication is to *prevent or arrest atrophy* as being a process of retrogression or degradation. This indication is in many instances difficult or impossible of fulfilment. The attempt to meet it always demands careful consideration of the circumstances under which atrophy has arisen in the particular instance before us.

First, local and general nutrition is to be corrected. Blood is to be restored in full quantity and of sound quality; and the fulfilment of this indication may involve attention to food, digestion and assimilation, as well as excretion. The value of natural food as compared with artificial substitutes has especially to be remembered in the atrophy of infants. Nutrient vessels may demand repair, such as the coronaries in local atrophy (fibroid degeneration) of the heart. Poisons like alcohol and lead will have to be avoided or eliminated, and the (hypothetical) toxins of syphilis and certain other diseases which produce vascular disease will have to be neutralised.

Secondly, use is to be restored to parts which have become atrophied by excessive rest. On this principle we remove splints and bandages which have restrained the movements of limbs and joints, and order graduated exercises, massage and electricity. In the case of an internal organ we attempt to evoke a display of its specific energy by natural or artificial stimuli. The atrophied stomach is sought to be restored by cautious return to more substantial food and the use of stomachics; the enfeebled heart by graduated movements, strychnine and digitalis.

Thirdly, the state of the nervous supply of an atrophied part must be estimated faithfully and amended if necessary. Many familiar instances of the application of this therapeutical principle will occur to the student in connexion with atrophy

from peripheral neuritis or from lesions of the anterior cornual cells. Nerve fibres can be successfully regenerated if proper attention be paid to the cause of the neuritis, and to the selection and employment of remedies—electricity, massage, medicinal nervine stimulants, etc. Atrophy from spinal lesions is but little amenable to treatment. In this connexion it is important to observe that much more might be done than is attempted at present to prevent or remove the weakness and falling-away of which patients complain as an effect of confinement to bed. This appears to be due, partly at least, to absence of the usual physiological stimulus constantly proceeding to the lower limbs in use of the feet.[1]

In those remarkable essential atrophies which are referred to exhaustion of the primordial energy of the proper cells of the part—premature oncome of that decay of tissues which normally limits life—regermination or regeneration is not within our power. See Degeneration, p. 75.

In the next place, the *fibrosis* which usually accompanies atrophy as a reparative process *calls for control*. In its earlier stage, when it displays the activity of a subacute inflammatory process, the associated vascular excitement is to be reduced by local depletion. Saline purgatives, for example, are beneficial in incipient cirrhosis of the liver. Counter-irritation, mercury and iodides are also credited with possessing a restraining action on these sub-inflammatory fibrotic changes.

Lastly, certain consequences of atrophy call for therapeutic interference. The most striking and interesting of these are deformities, such as occur in infantile paralysis and progressive muscular atrophy—the results, let us observe, of anatomical readjustment and only indirectly of the atrophy or cause of atrophy itself. This subject is considered under the head of Anatomical Readjustment.

Therapeutical Study of Hæmorrhage.

The primary factors in the production of hæmorrhage are three in number: a lesion or breach of continuity of the vessel-

[1] Dr. F. W. Mott (personal communication).

wall; the blood pressure at the affected spot; and the state of the blood. Sometimes one factor, sometimes another, is the most important. Thus wound of an artery or vein permits hæmorrhage even with a falling blood pressure; indeed, it may prove fatal, that is, proceed until the pressure falls to *nil*. Ulceration into a vessel acts in the same way, as we see in typhoid fever and pulmonary tuberculosis. On the other hand, the pressure may rise to so great a height that it ruptures a healthy vessel—necessarily at the weakest spot but still a spot free from disease as far as can be discovered, although there may be a strong presumption that the high pressure which existed before the hæmorrhage, or the state of the blood, had been steadily reducing the resistance of the wall. Such is the hæmoptysis of mitral disease and of some cases of acute pneumonia, the hæmatemesis of cirrhosis of the liver, and epistaxis in plethoric subjects. Great and sudden rise of pressure during exertion or excitement appears to determine hæmorrhage. Changes in the blood are sometimes present in hæmorrhage, and may then be regarded as one of the factors of it (purpura, scurvy, leukæmia). They appear to act partly by weakening the vessel-walls, partly through the agents of coagulation. Concurrence of the three factors is typically met with in the cerebral hæmorrhage of granular kidney—high arterial tension easily rupturing the walls of the least-resistant branches, which have become degenerated and aneurysmal under the influence of the same and of the impure blood. The brain is but one of the many situations of hæmorrhage in this disease, the blood pressure being universally high and the vascular system extensively degenerated.

Indications.—(1) *Arrest of Hæmorrhage.*—Such being the general pathology of hæmorrhage in respect of its origin, our primary object will be to arrest it. But we must find more specific indications than this. These are: to restore the continuity of the vessel, that is, to close the broken and bleeding point; to reduce or actually cut off for a time the blood pressure within; and to promote clotting.

Where the seat of hæmorrhage is accessible, the surgeon closes the bleeding point by placing his finger on it, or by using a forceps or a ligature; or he plugs a bleeding cavity. If

he cannot find the bleeding point he follows the second indication: he reduces the blood pressure. He elevates the affected part; he compresses or even ties the artery in its course: the blood flow and blood pressure are arrested together, and his object is attained. Or instead of either of these methods he may find it convenient or necessary to promote coagulation of the blood in and about the wound in the vessel by the use of styptics, such as persalts of iron, iron-alum or nitrate of silver; and the cautery has the same effect.

Unhappily the seat of hæmorrhage is very often inaccessible —in the substance of the brain, at the cardiac orifice of the stomach, in the lung, where the employment of ligature or direct styptic could not be practised except perhaps by the most dexterous surgeons under desperate circumstances. We are compelled to find other means of influencing broken vessels in parts beyond reach of our hands.

When we study such hæmorrhages with this end in view we discover that spontaneous arrest of them is very common. Further, when this process of arrest is examined it is found to be effected in precisely the same three ways as before, namely, by closure of the breach in the vessel-wall, by fall of the blood pressure, and by clotting; or by combinations of the three. The first of these modes, closure of the bleeding point, is partly active—by contraction and retraction of the coats; partly passive—by plugging of the opening and compression of it from without by coagulation. The second mode, fall of blood pressure, is a result of the failure of the heart and the loss of general arterial tone which attend hæmorrhage, and of the bodily rest which is insured by faintness. Coagulation follows naturally on the disturbed relations of vessel and blood, and according to some authorities occurs more readily in hydræmia. We have here abundant suggestions for treatment, rational, practicable, and—as the result often proves—really valuable. It will be most profitable to discuss this part of the subject from the side of the remedies which may be used to fulfil the different objects.

Both active contraction of the broken vessel and coagulation within and without it are promoted by rest—of the affected part, of the body as a whole, and of the mind; and

the same measure tranquillizes the circulation and lowers the blood pressure. Rest must always be our first consideration in the treatment of internal hæmorrhage—whether into brain, stomach, or bowels. It is carried out mechanically and physiologically, by different means for different organs and circumstances which need not be particularized here. The patient often must be treated where he lies; physical examination restricted; and the usual attentions of the nurse postponed till the crisis is past. The difficulties which arise in some instances are obvious: the chest must continue to move in hæmoptysis; the heart beats itself to death in intra-pericardial hæmorrhage; the stomach becomes excited to contraction by the presence of a great blood clot within it, which it violently ejects by vomiting; the bowel falls into a similar state of unrest in typhoid hæmorrhage. Under these desperate circumstances we have recourse to a drug which fulfils all three indications for rest. Opium puts an end to muscular movements, reduces local functional activities in the different organs, and promotes mental calm and sleep. There are a few instances, such as cerebral hæmorrhage, in which this drug is contra-indicated; otherwise a hypodermic injection of morphine may be regarded as the first step to be taken in the routine management of internal bleeding. Extremes of cold and heat promote both coagulation of the blood and active contraction of the broken vessel. The action of hot water injections in metrorrhagia is invaluable. Cold is usually applied in the form of ice—to the head in cerebral hæmorrhage, to the abdomen in intestinal hæmorrhage, and (as some authorities recommend whilst others regard it as useless or dangerous or both) to the chest in hæmoptysis. It must be regarded as doubtful how far the influence of these extreme temperatures can penetrate and be of genuine service in closing a deep-seated artery. As a matter of fact we rarely trust to them, but prescribe medicinal agents which shall be carried in the blood to the very part, and act specifically there. Such agents we find at our disposal in vascular astringents —silver, lead, alum, ergot—which excite contraction of the muscular elements of the vessel-walls; and in the constringents —the same drugs, persalts of iron, tannic acid in its many forms, and diluted sulphuric acid—which promote coagulation

of the blood and interstitial fluids and a condensation of the connective tissues related to tanning. All these different drugs may be rationally employed, a careful selection being made according to circumstances.

Reduction of the blood pressure is also the principle involved in many of the sedative and astringent measures, positive or negative, in common use. It manifestly will demand the exercise of close and continuous observation and of sound judgment to say how far faintness—the very condition of circulation which threatens life in the direction of syncope and yet contributes to the desired end—is to be employed as a method of recovery, by being permitted, copied, or even increased by venesection. All stimulants are interdicted; or if they are demanded by imminent dissolution, only an amount sufficient to preserve life is given, with the finger on the pulse. The same remark applies to food: it must be sparing, of the most simple kind, cold, and administered in very small quantities with the pulse as guide. In hæmorrhage into the brain, and perhaps elsewhere, complete abstinence for a day or two may be best. Next to these negative measures, purgation is most commonly practised. In cerebral hæmorrhage, for example, croton oil or jalap is administered; in hæmatemesis and melæna from portal congestion a full dose of calomel. Purgatives remove from the blood not only water but also substances which increase arterial tension. On the principle of "derivation" the vessels of the integuments may be dilated over a considerable area with fair prospect of benefit. Baths and other applications containing mustard may thus be of service in internal hæmorrhages; and dry-cupping appears to act partly in the same way. It cannot be said that depressant drugs are deliberately employed nowadays in bleeding which demands anxious treatment: the value of aconite, antimony, ipecacuanha and potassium iodide in hæmoptysis can be otherwise accounted for.

The most extreme measure employed to reduce the blood pressure in internal hæmorrhage is abstraction of blood by venesection, cupping or leeching. This is indicated in cerebral hæmorrhage with very high tension or ingravescent symptoms; although it must be observed that in this particular situation,

whilst the primary indication is to arrest hæmorrhage, the danger does not lie in syncope from loss of blood but in laceration and compression of the brain by the extravasation. This point will be discussed under the head of "effects." The same remarks apply to abstraction of blood in mitral stenosis, when timely leeching or venesection might avert or relieve hæmoptysis, distress of a peculiarly severe kind, dilatation of the heart and infarction of the lung, all referable to excessive tension in the pulmonary circuit. It is usual on a similar principle to permit hæmorrhage from the nose in plethora, and from the rectum in portal congestion.

(2) *Removal of the Local Effects and Products.*—As we have just seen, the evils attending hæmorrhage may be indirect as well as direct. Extravasated blood tears, separates and compresses the elements of a solid organ, such as the brain, cord and retina; and in a strangely paradoxical way closes the capillaries and renders anæmic and functionless the parts which it floods with blood. When the hæmorrhage has ceased, absorption and moderate inflammation may effect removal of much of the blood and *débris*, whereupon a degree of repair follows. It is doubtful whether we possess any means of accelerating this process therapeutically, or of rendering it more complete. In the brain we are careful not to quicken the circulation for a considerable time after an apoplexy—indeed we usually attempt to control the vascular reaction; but superficial extravasations, in the region of the orbit for example, are popularly believed to disappear more quickly under various remedies. Hæmorrhage into mucous tracts is followed by catarrh; and in some situations this is beneficial in its effect, which is to clear out the last traces of blood. This may be observed in hæmoptysis, and is encouraged by such expectorants as ipecacuanha or antimony, the sedative action of which is otherwise valuable.

An unfortunate local effect of blood clotting or extravasation in connexion with hæmorrhage is that it affords a nidus for pathogenetic micro-organisms in situations accessible to them. Grave symptoms are sometimes developed after plugging of the nares for epistaxis; and ought to be prevented

if possible. The tubercle bacillus is also believed to flourish in blood-residues in the lungs after hæmoptysis; a result which might be averted by the employment of expectorants just referred to.

(3) *Removal of the Remote Effects of Hæmorrhage.*—This consists in the treatment of anæmia. The grave effects of profound anæmia from loss of blood must not be forgotten. Transfusion may have to be performed. The administration of oxygen has been suggested, but does not appear to be rationally indicated. Rest has to be maintained for a considerable time; and bodily, mental and physiological exercise very gradually resumed. The organs, including the heart, are not simply weak: they may be in a condition of granular or even fatty degeneration.[1] The fever which attends some cases of hæmorrhage calls for simple salines only. Finally, the restoration of the blood must be promoted by familiar means which do not call for consideration in this place, particularly food, fresh air, and iron in appropriate forms.

Therapeutical Study of Dilatation.

The next pathological process of importance which we have to study in our search for therapeutical indications is dilatation. Although commonly regarded as entirely morbid, and familiarly associated as it is in the heart with valvular incompetence, disability and failure of power, dilatation proves to be in some respects a method of relief and even of compensation; a method also, even in its less favourable form, of temporarily preserving or prolonging life.

Many of the most instructive facts connected with dilatation are discovered by means of clinical observation as well as pathologically; but it will be more profitable and convenient for us to consider all the relations of the process in the present place.

Description.—Dilatation occurs in connexion with hollow muscular organs, particularly the heart, stomach, intestines and bladder; but any natural cavity, chamber, tube or duct may

[1] T. Henry Green, *Trans. Clin. Soc. London*, vol. viii. p. 160.

be thus enlarged in capacity (calibre), and so may the blood vessels, highly vascular and distensile organs such as the liver, the connective tissue spaces and serous sacs, and the lungs. For the most part we shall employ dilatation of the heart to illustrate the process in its many bearings, as being both the most familiar and important instance of this pathological change.

Two different kinds of dilatation are met with in disease, and must be kept distinct: (1) dilatation from *over-filling;* (2) dilatation originating in *insufficient emptying.*

(1) *Dilatation from Over-filling.*—This is well illustrated in aortic incompetence. The left ventricle is filled from two sources—the aorta and the left auricle, and both pathologically and clinically the chamber is always found enlarged. In mitral incompetence the left ventricle is also dilated by over-filling, being charged with the excessive volume of blood which it receives from the dilated auricle and which it has to accommodate. The aorta and arterial system as a whole are dilated — laterally and longitudinally stretched — in aortic incompetence by having in a similar fashion to receive the contents of the dilated left ventricle. The left auricle and the pulmonary veins and capillaries are over-filled in mitral regurgitation. In severe exertion the right heart is filled by the large influx of blood from the muscles more rapidly than it can be emptied. In each of these instances the cavity is over-filled and it dilates in consequence. The stomach is dilated in large eating and drinking.

If we turn now from these simple facts to a consideration of the mechanism of them in our outlook for principles on which to treat it, this kind of dilatation proves to be a purely physical process. The admission of a *plus* quantity of blood into a chamber of the heart, or of food into the stomach, will raise the pressure on the internal surface of these viscera, and will produce dilatation as a simple mechanical result. Five ounces of blood could not be contained in a four-ounce chamber without stretching its walls. This is done with safety and sometimes with positive physiological advantage, but the process necessitates certain conditions, which must be carefully appreciated. The first of these is extensibility of the walls.

Variable capacity of accommodation in hollow or spongy organs under pressure could not occur unless their walls were extensile. Elasticity is closely associated with this property. The capacity of the cardiac chambers, that is, the amount of blood which they contain at the end of systole and diastole respectively, is not fixed rigidly as we are accustomed to represent it in our discussions of the mechanism of the heart in health and disease. The high extensibility of their walls, especially those of the left auricle, provides for considerable variations in the amount of influx, in the degree of resistance to discharge, and in the relation of these to each other, *i.e.*, the pressure and the volume of blood within the cavity. We speak of the left ventricle as holding and discharging four ounces of blood, but the really important fact is that its walls are sufficiently elastic and extensile to enable it to contain (accommodate) a *varying amount* of blood. Otherwise, we should be in danger of perishing of paralysis, spasm or rupture of the heart in every violent effort or fit of passion. Blood vessels possess similar provisions against incessant changes in pressure and bulk of contents, and so do the stomach, bowels and bladder. In this way the tissues of hollow muscular organs yield gradually, and to an extent proportionate to the force acting upon them. It is an essential condition of the occurrence, and if need be of the establishment and maintenance, of this form of dilatation that the extensibility of the tissues concerned, whether heart, vessel or viscus, should be of a high order. It will be observed that we have succeeded in tracing here a physiological basis of dilatation.

Time is a second condition. Dilatation under pressure occurs most perfectly, that is, with the best prospect of proving useful, when it is set up gradually. Yet how perfect is the provision is proved by the remarkable toleration of distension from over-filling exhibited by the heart in violent exercise. In the case of valvular incompetence, commonly sequential as it is to endocarditis, the process is slow, and the stress is steadily raised on the cardiac walls.

Thirdly, if dilatation is to be safely accomplished, the increase of internal pressure under which it occurs must be moderate.

Originating under these conditions, dilatation from over-filling manifestly has a conservative effect. In a single word this is *accommodation.* The dilated left ventricle of aortic incompetence contains at the end of diastole a quantity of blood and bears an internal pressure which but for this accommodation would cause or lead to rupture or paralysis. As far as this accommodative effect goes, then, dilatation from over-filling is entitled to be regarded as a protective, conservative and indirectly recuperative process.

But this accommodation is brief, and would be of little value as a conservative process unless there were associated with it a fourth condition, namely, increased muscular contraction in proportion to the distension; and beyond this—if the accommodation is to be established and maintained as of something more than temporary service—concomitant hypertrophy of the walls on which the increased pressure has fallen. The chamber must be sufficiently emptied, as well as comfortably filled. The origin of this hypertrophy requires to be accurately appreciated. It arises in reactive response of the muscular tissue of the walls to the increased volume of contents which has been accommodated and has to be propelled. Conveniently and comfortably accommodated during filling-time of the chamber (dilatation), and sufficiently discharged during emptying-time of the chamber (hypertrophy), the excessive charge is satisfactorily disposed of. In the case of aortic reflux, for example, the *quantum* of blood which regurgitates through the incompetent valves demands only extra room and extra force; and these being automatically provided, *compensation* of the lesion is the result. Compensation is thus established by the association of hypertrophy with the dilatation; but let the reader carefully observe once more that dilatation as well as hypertrophy is an essential element of the process.[1]

To this process as a whole various names have been given: dilatation with efficient hypertrophy, accommodative dilatation.

Failure.—Dilatation from over-filling regarded as a method

[1] Compare Foster, Quain's "Dictionary," vol. i. pp. 845, 848.

of compensation is obviously precarious, and in point of fact it fails in various ways.

In a small number of instances the limit of extensibility of the walls is exceeded. One of these events then occurs: the walls either give way or are paralysed, or they are thrown into clonic spasm. The heart is very rarely ruptured in this way; more commonly a sudden rise of internal pressure from over-distension of the aorta and heart produces syncope and death. It is different with the pulmonary vessels in mitral disease. Filled as they are both from the right ventricle and the left auricle, their extensibility, although great originally, as is proved by their varicosity on the alveolar walls, often reaches its limits and cannot bear further pressure. Rupture is the result, manifested clinically by hæmoptysis.

Occasionally the dilatation fails to be established from want of time and excessive pressure. No doubt this is another way in which sudden death occurs in some forms of cardiac disease, such as rupture of the aortic valves.

Of all the conditions, however, which we have determined to be necessary to the establishment of dilatation as a conservative process, *concomitant hypertrophy* is the one which most frequently fails to be maintained. As soon as hypertrophy breaks down, from any one of the causes which we reviewed at page 78, particularly interference with nutrition, nervous depression, toxic disturbance or unreasonable demand upon it, and when the force displayed by the wall which has to react to the pressure falls relatively to it, compensation is undone. Thereupon fresh dilatation is set up; but it is dilatation of another kind. It is not dilatation from over-filling, for the condition in this respect is not different from before: it is dilatation from *insufficient emptying*. This introduces us to the subject of the second kind of dilatation.

(2) *Dilatation from Insufficient Emptying: Residual Dilatation.*—This kind of dilatation is familiarly met with not only in failure of the heart, but also in pyloric obstruction, acute intestinal obstruction, and retention of urine in the bladder or in the kidneys (hydronephrosis). There is no difficulty in understanding how dilatation occurs in the latter organs

(stomach, bladder, bowel, etc.) by an accumulation of undischarged contents. On the other hand, there would appear to be a liability on the part of students to misunderstand the mechanism of this kind of dilatation as it occurs in the heart, and to confound it with dilatation from over-filling.

In order to simplify the discussion, let us again assume that the case in which the muscular wall with its concomitant hypertrophy has failed is one of aortic incompetence. Consequent (it may be) on imperfect nutrition from coronary disease, the enlarged left ventricle fails any longer to sufficiently overcome the internal pressure or resistance of its contents. Systole is incomplete; that is, it is not completed. Its work is unfinished. The ventricle fails—to empty itself sufficiently: to complete its proper discharge. A proportion of its contents is left behind; and the next charge which the ventricle receives from auricle and aorta is added to it. Thus the chamber is over-distended during diastole, *in proportion to the amount of residue* (*arrears*) *at the end of the previous systole.* There is now even more blood than before to be discharged by the inefficient ventricle. The process is repeated, continuing as long as the hypertrophy fails; indeed it essentially progresses unless its cause be removed, and by over-stretching the elastic walls it comes to actually strain them. This is dilatation from insufficient emptying or retention, by arrears or residues, residual dilatation, dilatation from or with failure.

In the same way as compensation breaks down in aortic regurgitation, so pure hypertrophy may fail and residual dilatation occur; for example, in aortic obstruction and in the left ventricular hypertrophy of chronic Bright's disease. This is also the way in which the hypertrophied right ventricle dilates in mitral disease—by inability to empty its contents sufficiently into the tense pulmonary artery in consequence of failure of nutrition or of increase of the lesion, or both, or from other cause of increased pulmonary obstruction such as bronchitis. Dilatation of the stomach in pyloric obstruction, actual or relative, has a similar origin.

The student may now take another step and learn that it is in this way that a weak or enfeebled heart dilates independ-

ently of previous enlargement, of valvular disease of any kind, or even of increased peripheral resistance. Acute dilatation of the heart in the specific fevers, *e.g.* scarlatina,[1] is produced by failure to complete its systole and the consequent accumulation of residues; and the bladder and the stomach become over-distended in the same diseases in part at least from a similar cause. In all these instances the nutrition of the nervo-muscular walls is at fault; and a similar condition of the intestinal wall accounts for meteorism in acute peritonitis.

Finally, we discover that this is in part the mechanism by which a perfectly normal, healthy or strong heart becomes dilated during violent exertion—by inability to empty itself against increased arterial pressure as fast or as freely as it is filled (or over-filled, as we have seen) with blood pouring into it from the active skeletal muscles. Within ordinary or reasonable limits dilatation of the heart in this way occurs safely. The high elasticity of the cardiac walls provides for this. The failure lasts but for a few moments, constituting the embarrassment familiarly seen in the competitors at the end of a race: it is quickly relieved—partly backwards (as we shall presently see) by the safety-valve action of the auriculo-ventricular valves and residual dilatation of the veins; partly forwards by fall of the arterial pressure consequent on rest. So the dilated stomach in pyloric obstruction relieves itself backwards by vomiting. Only in the event of strain of the fibro-muscular structures, by excessive degree or suddenness of the stress or from previous unsoundness of the walls, is real damage done—cardiac overstrain; acute dilatation of the stomach. We have thus traced even residual dilatation and mechanical congestion to a physiological provision for temporary accommodation.

Residual dilatation, when it affects the diseased, the weak, or the embarrassed heart, does not stop at the chamber first involved (whatever it may be) unless conditions quickly alter for the better. The process progresses backwards, but relief cannot be obtained by evacuation as in the vomiting of dilated stomach. It is true that in acute embarrassment from

[1] Goodhart, *Guy's Hosp. Rep.*, London, 3rd ser. vol. xxiv. p. 153.

violent muscular effort the venous congestion which occurs rapidly under our observation almost as rapidly passes off. But in ordinary failure of the heart in mitral disease the same process is steadily developed. The vascular areas situated (physiologically) immediately "behind" the right chambers are insufficiently drained, over-distended, and thus dilated. The mechanical congestion of the great veins (including the inferior cava and its tributaries) which is set up consists in dilatation by residues. The hepatic veins and portal system presently become involved. Under these circumstances, that very vascular and distensile organ the liver increases in volume by engorgement of its vessels; that is, the capaciousness of its vascular area is greatly increased by dilatation of the vascular lumina due to insufficient emptying.[1] On the mucous surfaces drained by the portal vein internal pressure partly relieves itself by hæmorrhage.

If the cardiac failure which led to the mechanical congestion still remain unrelieved, a further series of elastic chambers begin to present evidence of accumulation and dilatation from imperfect evacuation. The lymphatic or areolar spaces of the connective tissues become œdematous, and their associated serous sacs—the peritoneal and pleural in particular—become distended with dropsy. At the same time a serous drain occurs into the uriniferous tubules of the deeply congested kidneys, producing albuminuria; and a serous flux from the bowels.

Thus, in a case of ordinary cardiac dropsy originating in mitral disease a process of dilatation and mechanical congestion from failure of propulsive power to overcome resistance ahead progresses backwards, involving the left auricle, the pulmonary vessels, the right chambers, the inferior cava, the liver, the portal system and the terminal systemic veins, until it falls finally on the lymph spaces which contain the ultimate cells of the body and interferes with the flow in the capillaries themselves. Theoretically we regard and speak of this back-

[1] "The venous reservoirs in the livers of some seals fulfil the same end [prevent influx of venous blood into heart in diving] in protection of the heart." —Clifford Allbutt, "Essay on Cardiac Strain," *St. George's Hosp. Rep.*, London, 1871, vol. v. p. 35.

working as "progressive," and trace the process backwards step by step; but of course any block in the circulation immediately affects in some degree the pressure in the whole of the circuit behind it.

When we study with attention the disturbances of function of an organ which give rise to dilatation from insufficient emptying, we find that it is always connected with weakness or failure, absolute or relative, of the muscular structures in the walls. Failure of a chamber to empty itself is something far more than a simple physical fact like dilatation from over-filling. Lack of muscular energy, actual or relative, leads to an accumulating or increasing volume of arrears, first within the organ itself, next in the parts behind it.[1]

It is a matter of great importance for the therapeutist to have a clear understanding of the essential difference that exists between the two kinds of dilatation: dilatation from over-filling associated with efficient hypertrophy, and dilatation from failure of emptying. Dilatation of the heart or stomach from over-filling is the result of a purely mechanical process, the two essential elements of which are over-distension of a chamber, from over-charging, and increased capacity, from stretching of its elastic walls. Dilatation of the heart or stomach from failure and insufficient emptying implies serious physiological inadequacy, originating as it does in work unaccomplished, consequent on parietal weakness—on inability of the muscular and elastic walls to complete the proper evacuation of the chamber, on inefficiency of the driving power to overcome sufficiently the internal resistance. Dilatation from over-filling of the heart with its associated hypertrophy is a method of successfully meeting a difficulty or defect in the circulation by elastic accommodation and increased activity; dilatation from insufficient emptying is a process of yielding or breaking down in the face of a difficulty. The first process is significant of relief, compensation and safety; the second process is significant of failure, disability and danger.[2]

Several other unfortunate effects are produced indirectly

[1] See Bristowe, Quain's "Dictionary," art. "Heart, Dilatation of," vol. i. p. 798.
[2] Bruce, Keating's "Cyclopædia of Children's Diseases," 1889, vol. ii. p. 797.

by the accumulated residues. In the stomach, intestines and bronchi residues become the nidus for bacterial decomposition which results in local irritation, inflammation, ulceration and the development of gases which increase the internal or dilating pressure on the walls. It is also unfortunate that residual dilatation is progressive, unless the cause of it be brief, by starting a vicious circle which ends by aggravating the original disability. Thus the mechanical congestion and dropsy of the great viscera consequent on cardiac failure sap the nutrition and vigour of the ventricular wall *viâ* the blood, and the wall of the heart itself is congested with the rest. Another important consideration is that dilatation from failure of a hollow muscular organ tends to increase when once started, internal resistance rising mechanically with the size of the chamber.

So far it would appear as if there were nothing conservative in dilatation from failure: that it leads but in one direction—towards arrest of the circulation. Happily this is not the case. There is a grain of good to be discovered even here. Like dilatation from simple over-filling, dilatation from insufficient emptying affords temporary accommodation to an organ in arrears. It is an unfortunate state; but the assistance afforded by it is real and effectual for the time being. It is founded on a strictly physiological provision. In over-distension of the right ventricle we recognise the safety-valve action of the tricuspid, consequent on dilatation of the chamber.[1] Granting the existence of primary cardiac disease, say aortic obstruction, and granting the existence of cardiac failure, say from exertion, it is better that dilatation of the left ventricle and mitral orifice should occur than not, the only alternatives being sudden failure (syncope, angina pectoris) and rupture of the walls. The occurrence of dilatation saves the heart—temporarily at any rate. It appears that acute dilatation of the heart from disease, desperate though the condition be, may be recovered from, or, more correctly, may be *the method of recovery* from threatening death by parietal failure. Here, as elsewhere, the dilatation is not the primary fault but

[1] Bristowe, *loc. cit.* p. 798. Wilkinson King, *Guy's Hosp. Rep.*, London, 1837, vol. ii. p. 104; and 1841, vol. vi. p. 39.

a result of it. If the fibres are actually over-strained, as in muscular effort, and the cavity remain permanently dilated, hypertrophy may supervene and effect compensation.

Even mechanical congestion of veins and viscera, when regarded in this light, proves to be a gauge not only of the failure of the circulation but of the temporary relief afforded to the heart by the intravascular pressure having spent itself on the dilatable tissues around: of the accommodation within them of the blood which the heart is unable fully to dispose of either by propulsion or by further stretching of its own walls.

When evidence of still graver failure of the circulation makes its appearance in the form of dropsy, it is difficult to believe that this can have other than a highly unfavourable and ominous significance. Yet, serious as it is, we may recognise even in dropsy a further opportunity of temporary relief. Another series of elastic chambers have come into service, and afford a desperate method of escape for the time being from the evil consequences of backward pressure, especially hæmorrhage. Marked amelioration of urgent symptoms sometimes attends the appearance of cardiac dropsy set up in this way in the failing heart of chronic Bright's disease. It is true that cardiac dropsy is intimately associated with distress; it is a definite index of the difficulty of the heart and of the gravity of the prognosis; and the removal of it greatly relieves the patient. Very naturally, therefore, it has come to be regarded as the cause of all the unfavourable symptoms. But (excepting mechanically in the chest and abdomen) dropsy, instead of embarrassing, probably relieves the heart for a time. Part of the relief which the sufferer from cardiac failure obtains by sitting up is due to increase of the dropsy in the lower extremities—the free escape of fluid into the feet and legs.

We learn from these considerations that the best that can be said for dilatation, particularly for dilatation from failure and insufficient emptying, is that it is a kind of accommodation. Now accommodation in physiological relations denotes a precarious situation, just as it does in financial relations. It is an acknowledgment of weakness or actual poverty, calling

for extraneous help. It is a method of surmounting a difficulty temporarily, but at the same time it is an evidence of exhaustion of that reserve which characterises soundness of constitution or solvency of position, and which can be reckoned on in the event of even excessive demands. Moreover, the unsound heart is further beggared in the course of failure by obtaining this accommodation at the expense of its best friends—the lungs and the chylopoietic viscera. This is a ruinous mode of relief. "Better die than have dropsy" is a commonly expressed opinion, comparable to the other "Better break at once than go on borrowing." Residual dilatation is a morbid condition in which the assistance of therapeutics is peculiarly indicated. Nature has reached in it her last method of spontaneous relief, and this will in turn speedily fail.

Indications.—The position which the practitioner occupies in dealing with dilatation is a peculiar one. He has to do with a process which must not be encouraged or copied, or that has to be prevented or removed as the case may be; but one which at the same time is of service under unfavourable circumstances as affording accommodation for the excessive contents of a hollow and distensile organ, along with other methods of recovery or whilst they are being brought into action. The indications for the management of dilatation therefore may be formulated as follows:—

First, *to prevent or correct dilatation from over-filling*, by anticipating or correcting the conditions which give rise to it. This indication is impracticable in the case of the heart—unless on the general principle of avoiding physical exertion in valvular disease, strain being in part due to filling the heart more rapidly than it can empty itself. We cannot arrest aortic incompetence once it is established, nor the dilatation of the left ventricle and of the arteries that accompanies it as a necessary effect of a purely physical kind. The indication is easily carried out, however, in dilatation of the stomach. It is on this principle that we order a spare, rather dry diet, and forbid slops and fermentable and flatulent materials which yield abundant gases.

Secondly, *to promote and maintain concomitant hypertrophy, extensibility and the nutrition of the walls generally, when dilata-*

tion from over-filling is a necessity. Manifestly this indication is the key to the management of most forms of compensated disease of the heart, and relates to measures of the greatest practical importance. The methods to be pursued in maintaining hypertrophy were fully discussed in a previous chapter, and will be referred to again immediately. A sufficient supply of pure nourishing blood and moderation of the functional demands upon the tissues are acknowledged necessities; and if these are insured, the elastic and parietal structures will be in the most favourable conditions for preserving compensation.

Thirdly, *to prevent, control or remove dilatation from insufficient emptying.* It is to fulfil this indication, as we have just seen, that extraneous assistance is peculiarly and urgently demanded in dilatation. Fortunately assistance is abundantly available.

It should be ordered on the following principles: *The fundamental indication is to attend to the causes of the failure* of the chamber to empty itself sufficiently. It will often be found to be quite within our power to modify these in a favourable direction—to correct the conditions of life, of work and of nutrition, the nervous influences, the excessive functional strains (particularly in women), the indulgence in nervo-muscular poisons, such as alcohol and tobacco: in a word, the influences, singly or combined, which had undone hypertrophy. In dilatation with failure of the heart this is our first consideration.

The resistance ahead is to be reduced. The work of emptying the distended and dilated structures is to be lightened. In gastric dilatation from incomplete emptying, consequent on pyloric obstruction, there are at our disposal the radical operations of forcible dilatation, pylorectomy, and short-circuiting. A retroverted uterus must be raised off the blocked rectum. Surgical measures effect a similar result in dilatation of the bladder consequent on stricture. In the treatment of pulmonary emphysema the same principle underlies the aëro-therapeutical method of expiration into a rarefied atmosphere.[1] The reduction of peripheral resistance by rest,

[1] Quain's "Dictionary," art. "Air, Therapeutics of," vol. i. p. 28.

iodide of potassium, the nitrites and purgation largely contributes to the relief of the over-distended chambers in cardiac failure.

The third step in dealing with residual dilatation is *to raise the force or driving power of the muscular walls, and* (*it may be*) *re-establish or rehabilitate and maintain concomitant hypertrophy.* Nourishment is the first means of effecting this object. Strychnine helps to fulfil this indication in dilatation of the heart, gastro-ectasis and certain forms of intestinal torpidity; and tonic measures generally and improved nutrition contribute to the same end in these diseases and in atony of the bladder. Cardiac stimulants and tonics are employed in great variety, particularly those of the great digitalis group—a subject which will be found fully discussed under Valvular Disease of the Heart with Failure in Part II. Graduated muscular exercises in proper form and at the proper time have a similar effect. Part of the treatment of emphysema is founded on the same principle.

Assistance is also to be afforded to the incompetent and labouring organ in the form of *removal of residues* and the other unfortunate effects of these and of retrograde pressure. By doing so we practically relieve it of a portion of its work and "give it a fresh start." Lavage or vomiting in gastro-ectasis is a typical instance of the successful application of this method. So are well-ordered purgation in chronic constipation, and puncture of the bowel in the meteorism of intestinal obstruction. In residual dilatation of the heart the practitioner accompanies the measures already referred to with others calculated to remove the arrears directly. The distension of the great veins and the chambers of the heart is relieved by means of venesection, leeching, wet-cupping and dry-cupping—the last of these a method which is an exact copy of accommodation by dilatation and has an equally beneficial effect on the heart for a limited time. Removal of arrears by these methods is essentially a matter of urgency, intended to afford speedy relief to the over-burthened and labouring organs. On the same principle we may drain the distended vessels, viscera and serous spaces by the use of purgatives, paracentesis and puncture.

A point of great importance in connexion with attention to this indication is to reduce the internal pressure on the walls—due both to obstruction ahead and to residues—*as speedily as possible.* Not only will the patient be saved distress, but over-distension may be prevented from rising to that degree which actually strains or over-stretches the walls of the chamber beyond recovery. It is probably from want of timely interference that some cases of failure of the heart resist treatment of the most correct and promising kind.

By following these several indications we succeed in taking a further step. *We break into vicious circles.* This part of the treatment of residual dilatation is especially associated with the removal of arrears. Thus, in the instance of the failing heart, we check indigestion, mal-assimilation, malnutrition and consequent increase of cardiac inefficiency when relief is brought to the congested and catarrhal stomach and bowels, the blocked portal system and liver, the imperfectly aërated blood and the stagnant kidneys. Equally favourable if less striking results of the same order are secured by interruption of the vicious circles in dilatation of the other organs which we have mentioned in illustration.

Therapeutical Study of Anatomical Readjustment.

Under the name of Anatomical Readjustment may be described a method of natural recovery in which the functional impairment of an organ caused by structural damage is undone, neutralised or compensated by anatomical changes in related parts. Various recuperative processes are comprised in the group to which this name is given for the sake of convenience. Definite instances will serve to explain the method which we have now to consider.

The establishment of compensatory anastomosis or collateral circulation is a familiar instance of anatomical readjustment. Occlusion of a considerable blood vessel, when it is consequent on disease or on healing, or when it is produced by ligature, is followed by a rearrangement of related vessels, which compensates for the interference with the circulation. The development of free anastomosis between the portal and

systemic systems of veins under the stress of obstruction within the liver will be remembered in this connexion, and the part played by collateral circulation in preventing cerebral softening in embolism and thrombosis of the vessels of the cortex. The process appears at first sight to be simply one of redistribution of disturbed blood pressure, but the nervous system probably plays a part in it.[1]

A common form of congenital malformation of the heart is pulmonic stenosis with imperfect septum ventriculorum. We call the latter a "malformation" as if the septum were badly made; yet the communication between the ventricles is a normal condition of intra-uterine life, and by its persistence has the effect of compensating for the defect of the associated pulmonary opening. Thus it actually prevents the death of the fœtus, being less incompatible with life than the pulmonary lesion alone.[2] This is an instance of anatomical readjustment very closely related to compensatory anastomosis.

In the repair of phthisis and pleurisy an important part is played by the structures of the walls of the chest. These are automatically readjusted under the influence of the respiratory forces, of which the most powerful is atmospheric pressure. The inflammatory process within, the structural repair, and the hypertrophy of the opposite lung are indispensable methods of recovery which accompany it, but anatomical readjustment of the curves of the thorax is something added to these. Occasionally it is attended with local discomfort until it is completed, and it ends in deformity; but none the less it is a valuable method of recovery.

Closely allied to the instance just cited are the compensatory curvatures of the spine from other causes, and the readjustments, classed as deformities, in the limbs and trunk which are consequent on paralysing lesions, particularly in childhood.

A remarkable amount of anatomical readjustment occurs in association with unreduced dislocations. The various structures concerned in the articulation are modified organic-

[1] Coats, "Pathology," p. 56.

[2] Peacock, Quain's "Dictionary," art. "Heart, Malformations of," vol. i. p. 834.

ally under the influences about them, and the result is the restoration of the function on new though often very imperfect lines.[1]

When the spleen is extirpated, the loss is met by increased activity of the bone-marrow and lymphatic glands.[2] We are at once struck by the close similarity of this result of anatomical damage to the new formation of hepatic tissue which follows loss of a portion of the liver,[3] and to hypertrophy of the one kidney after disease or removal of the other. In the latter instances the functional impairment is compensated, but in the case of the spleen and marrow the repair is vicarious, readjustment being accomplished by change in a related organ.

Failure of Anatomical Readjustment.—Anatomical readjustment is found wanting; but less often wanting in its actual occurrence than in its results. Arterial anastomosis may prove insufficient to prevent softening or gangrene; the anastomosis between the portal and systemic veins may not occur and ascites supervene, or it may fail to bear the strain and hæmatemesis result. Patency of the septum ventriculorum may not fail to remain in pulmonic obstruction, and so the subject of the malformation is preserved for the time being; but the result of the "recovery" is nothing better than cyanosis, a condition incompatible with active extra-uterine life, and with life of any kind for more than a limited number of years. The readjustments of the chest and spine which we have cited as compensatory are, after all, deformities; and some of them seriously—it may be fatally—interfere with the viscera within. The bone-marrow may attempt to discharge the functions of the extirpated spleen, but it proves so poor a substitute that death is the ordinary result.

In all these instances failure of the effect or result of anatomical readjustment is referable to its essential weakness as a method of recovery. In this respect it is markedly inferior to hypertrophy, as is well illustrated by the instance of the spleen and marrow. Hypertrophy of an

[1] Nothnagel, *Brit. Med. Journ.*, London, 1894, vol. i. p. 740.
[2] Nothnagel, *Ibid.*, p. 740.
[3] Nothnagel (and Ponfick) *Ibid.*, p. 740.

organ is an evidence of its possession of sufficient resource within itself to meet an emergency: the kidney and the liver become hypertrophied when damaged. Anatomical readjustment is an evidence of impossibility or loss of intrinsic resource: it involves the vicarious help of related parts: medulla of bone becomes a substitute for spleen. Manifestly readjustment is but the best that can be done after repair anatomically and repair physiologically (hypertrophy) have failed or proved insufficient, or are impossible. Like all the methods of recovery that we have studied it is the outcome of purely physiological forces; but in most instances the forces—atmospheric pressure, blood pressure, and muscular strain—may be said to be of a coarser more physical kind than those at work in repair and hypertrophy.

Indications.—The indications for treatment drawn from the preceding study of anatomical readjustment are of a somewhat qualified character. They are as follows:—

First, *to favour anatomical readjustment*, but to do so with intelligent discrimination founded on full knowledge of all the pathological relations and the indifferent results of the method. In chronic empyema the surgeon removes a portion of one or more ribs to obtain anatomical readjustment of the parts and closure of the intra-pleural abscess. He does not do so inconsiderately however. He estimates the proper time for interfering, and the position and extent of operation calculated to produce the least possible disturbance of the parts whilst insuring the primary object of treatment.

Secondly, *to anticipate recourse to anatomical readjustment* by the timely fulfilment of more radical indications. We are in a position here to appreciate the importance of the great general indication which we have already reached in our study of hypertrophy—to encourage, follow, or at least entertain the more fundamental methods of recovery and treatment before higher methods are attempted. In many of the classes of cases referred to in the present discussion, we ought to prevent the need for anatomical readjustment as far as possible by striking earlier at the disease or at the cause in which it originates.

Thirdly, *to control anatomical readjustment* and correct its

unfavourable effects. On this principle are based many of the measures adopted to moderate the extent of deformities of the spine and limbs, to modify them favourably, and to rectify them if they have occurred—so-called orthopædics. This is now a very successful branch of surgery.

Forms or Methods of Natural Recovery and Indications from them.

Let us now collect and rearrange the different methods of Natural Recovery which have been discovered in our survey of the principal pathological processes. An estimate must be attempted of their respective value; and thus we shall be led to a statement of the broader therapeutical indications which are afforded by pathology.

Spontaneous Cessation of the Destructive Factor.—We have traced this form of natural recovery in connexion with some of the acute specific processes, with inflammation, degeneration, atrophy, and parasitic diseases. It indicates treatment in the form of support, patience (expectancy), and measures calculated to accelerate the course of events. Where spontaneous cessation does not occur, it serves at least to suggest an effort to substitute for it some method either of arresting the destructive factor or of promoting the conservative and recuperative factors of disease.

Resistance continued.—We have seen that when the enemy has reached the tissues and disease begun, resistance does not cease. All the elements of inflammation belong as much to pathology as to ætiology. The same indications are therefore valid: to continue to combat the efficient causes of disease, after it has been established: to do so directly; and to do so indirectly—by strengthening natural provisions for resistance which are insufficient, especially when the pathogenetic influences are virulent.

Limitation.—Intimately associated with phagocytosis on the one hand and with repair on the other are the processes of natural limitation which we studied under the head of inflammation, and which occur also in thrombosis. This

natural method of meeting pathogenetic causes and pathological processes, whether advancing in the tissues (encapsulation) or along vessels (thrombosis), or towards cavities (adhesions), was seen to be a common and invaluable provision for recovery. It is sufficient in itself to meet "ordinary" causes of disease. Sometimes it fails and requires help; sometimes it has to be controlled; sometimes it proves a remote source of recurrence of disease. Notwithstanding all this, limitation is a process always to be respected, usually to be promoted, and as seldom and as little as possible interfered with.

Repair. — Repair may be regarded as the principal method of natural recovery from damage wrought by pathogenetic influences. It is found at work in association with inflammation, embolism, thrombosis, atrophy and degeneration. Cells are regenerated by the epithelium, the fixed tissue cells and apparently by wandering cells also. The parenchyma of some organs and even portions of organs are reproduced to make good loss. The chief result of repair, however, is by means of fibrosis or connective tissue growth; and this, whilst immediately invaluable as preserving life and restoring the continuity of organs and surfaces, often proves unfortunate in its ultimate effects—stricture, sclerosis, cirrhosis, deformity, vascular obliteration, impaired and disordered functions, etc., as well as diminished resistance to pathogenetic influences in the future. These effects of repair prove to occur more frequently and to be more severe when repair is slow. A great general indication follows: to promote but control repair under all circumstances.

Removal of Products.—It appears that in all the principal pathological processes a spontaneous effort is made to secure the continuous removal of dead or degenerated tissue elements, including phagocytes; of the enormous excess of cell-growth and cell-products (mucus, etc.) which usually attends repair; and of micro-organisms and their products—in a word, of the *débris* which constitute the products of disease, as well as other effects of it. Inflammation, hæmorrhage, embolism and thrombosis (softening, gangrene, etc.), degeneration and atrophy present this method of natural recovery at work.

Failure of it (retention, tension, etc.) may, however, occur, in respect of the amount, continuousness or even occurrence of the discharge; and then some of the gravest evils of disease are originated (absorption, infection, etc.). Interference to promote this natural process as promptly and fully as possible is urgently indicated.

Arrest of Hæmorrhage.—A series of different automatic provisions come into action when the continuity of blood vessels is broken and hæmorrhage occurs; heart, vessel, and blood all contributing to the arrest of bleeding. But these provisions often fail, and death would follow if nature were left to herself. The indication is obvious, and the course of treatment to be followed closely corresponds with that of spontaneous recovery. In other instances local damage is the result, which often proves fatal.

Anatomical Readjustment.—A striking method of spontaneous recovery from the effects of disease is by readjustment of structures to each other anatomically and to new physiological relations. Bones, joints, tendons, etc., take new forms and directions, organs or parts of organs become displaced and variously altered in shape, and other anatomical changes occur; and all with the effect of restoring (or maintaining) health in spite of damage. The development of collateral circulation by arterial and venous anastomosis provides, in a similar way, for the maintenance of the circulation and of the nutrition of parts, when embolism, thrombosis or other interruption of the continuity of the blood supply has occurred and threatens to lead to necrosis (softening, gangrene). This form of natural recovery must be of great value at critical times, preserving the brain and other viscera as well as the limbs from grave lesions, or relieving an important system like the portal from the effects of obstruction. Such readjustments of course are but imperfect; they cannot be accomplished in connexion with some organs; and frequently they are positively harmful. They therefore indicate the employment of measures not only to facilitate them when necessary, but to prevent or control them, and to modify or remove their unfortunate effects.

Hypertrophy.—Very closely related to adaptation amongst

the methods of Natural Resistance, which meets functional strain with an accurately proportioned display of active energy, is hypertrophy amongst the methods of Natural Recovery. Hypertrophy indeed originates in reaction to functional strain —mechanical, secretory, or otherwise: it is the chief means of functional repair: of compensation for functional loss and disability. Necessarily hypertrophy has its limits; and it depends for its maintenance on the existence of a number of conditions which are often deficient. In either case it may fail; and in every case it is more effectually established, maintained and restored by intelligent assistance.

Anatomical Re-accommodation. — When the contents, whether fluid or solid, of hollow organs like the bladder, heart, blood vessels, pulmonary alveoli, stomach, intestines, etc., are disturbed in their amount, in their transit or movement, or in their discharge, there is a spontaneous provision for affording them local accommodation, neutralizing or compensating the disorder, and thus preventing immediate disorder or even disaster (rupture, etc.). This is dilatation, originating essentially in extensibility, and dependent for permanent usefulness as a means of compensation on associated hypertrophy, the maintenance of which is the chief indication connected with dilatation. When it originates in parietal weakness of the organ, dilatation is a ruinous form of accommodation, inasmuch as it is significant of failure; and at the best it is but a highly precarious method of temporary recovery from disability and damage which is to be prevented by all means and removed as speedily as possible.

Summary: General Principles; Value of Pathological Indications; Practical Applications.

We may now review collectively the many facts and considerations which have presented themselves to us in the preceding discussion on the principles of treatment founded on pathology.

We have seen that when natural resistance proves vain and the pathogenetic influence gains ascendency, either death occurs or disease is established. But when they are attentively examined, the processes of disease after all prove to be not

entirely destructive in their nature. The great majority of patients recover more or less completely; and the successful issue is often attained in the absence of (it may be in spite of) treatment. Disease includes conservative and constructive elements also. The struggle for life and health does not end with the establishment of disease. The enemy has penetrated into the country but every inch of advance is contested obstinately. Fresh methods of resistance are called into play, and not methods of resistance only but methods of recovery —repair of structure and restitution of function:

> Death and nature do contend about them
> Whether they live or die.

The effect is analogous to that of the resistant or preventive provisions which we previously reviewed. Those were the first fighting line; these are the second, which may recover the position that has been lost. They still resist; and they also neutralize and limit the invasion of the cause; possibly they expel it; and finally they may undo, in part or in whole, the evil which it has wrought by repairing damage and qualifying or compensating the disabilities left behind. In the presence of an active cause in their midst or of an active lesion, the cells, vessels and nerves—indeed all the elements—unite to continue resistance and to regenerate damaged structure. Whole series of pathological conditions, originating in what are strictly physiological processes, represent this stage of the struggle, especially phagocytosis and the constructive elements of inflammation, including resolution, proliferation, fibrosis and the discharge of pus and other products. Therewith and thereafter come what may be called functional repair, re-adaptation and compensation, particularly by hypertrophy and some of the various forms of readjustment of the body or organ (confessedly damaged in part or in whole) to its new circumstances, so as to restore the disturbed balance.

The result of these processes as a whole, anatomical and functional, may be either success or failure. Success means regeneration and recuperation; and the final result of these—aided no doubt in many instances by the definitely limited or natural course of the morbid process—is *recovery*, complete

or incomplete. In too many instances, however, the different processes of spontaneous recovery entirely fail. Instantly, suddenly, or slowly, as the case may be, the pathogenetic influence and its effects overwhelm or otherwise overcome the various provisions for recovery with which the body is furnished. The result is death—swift, rapid, or slow. But unless the pathogenetic agent be instantaneous or crushing, such as a severe trauma or an overpowering poison, the body makes an effort or attempt at reaction and recovery. This is a fact of the first importance to us in our search after principles of treatment.

Cardinal Conclusion.—We have thus reached another cardinal conclusion in connexion with the first principles of treatment: *that the body has a spontaneous disposition to mend: that under the name of pathology there are included not only destructive processes tending to disablement and death, but conservative and reparative processes as well, tending to spontaneous recovery. Spontaneous recovery often fails, however; and then death or disablement results.*

Under these circumstances there can be no question of the need for therapeutical interference. Our enquiry has taught us more than this, however. It has suggested where and how help is required. Whilst natural resistance continues and can be advantageously aided and controlled, the prominent feature of pathology from the therapeutist's point of view is Recovery, in the form of both anatomical and physiological repair and associated processes. These prove to be effected by structures and vital functions over which we have abundant control. Our opportunities of rational interference are thus proved, and the treatment of pathological processes is fully justified.

Value of Pathological Indications.—Indications for treatment drawn from pathology possess many advantages. They bring the practitioner face to face with the diseased organ or tissue. They direct him to destroy it, to sweep it away, to sacrifice the affected part for the sake of the whole; to close a broken vessel, to set a fractured bone, to evacuate pus, to correct a deformity, to promote the growth of a muscle. They are not dependent on a knowledge of causes, which are often obscure like that of syphilis, or intangible like trauma;

but on a knowledge of the human body, the anatomy of which, both normal and morbid, is familiar. In addition to this, pathological indications relate to conditions which can be investigated very thoroughly both during life and after death, and experimentally also, and which thus afford substantial instead of speculative bases for principles. These principles of treatment are further peculiarly satisfactory to the practitioner as their chief aim or end is repair or recovery, the most practical of all issues in the treatment of disease. Unfortunately this pathological indication and others come before us too late in many instances. Cure (recovery) is inferior to prevention in this respect. Again, therapeutical indications based on pathology are apt to be forgotten and neglected by those who are not familiar with morbid anatomy, and who are accustomed therefore to order their treatment in accordance with strictly clinical guides. As we shall find when we examine symptomatic indications, clinical phenomena are too often allowed to determine treatment instead of being employed as means of interpreting the deeper pathological conditions.

Practical Applications of Pathological Indications.—Attention to the indications afforded us by a knowledge of the pathological relations of disease prompts a great part of rational practice. Most obviously it concerns the surgeon, who deals with wounds, fractures, new growths, and the many phases and effects of repair, inflammation and necrosis. But the physician and the general practitioner must respect even as constantly and fully the therapeutical principles founded on the facts of pathology. Thus they learn from it the importance of preventing endocarditis in rheumatism by combating the destructive element of the disease; of controlling the severity and spread of valvulitis if it do occur; of promoting hypertrophy to compensate any lesion that may remain; and of dealing with dilatation according to its kind and its causes. The many practical problems connected with the management of vascular, cardiac and renal degenerations demand a clear appreciation of pathology. The successful treatment of pulmonary tuberculosis still turns more on respect for the great pathological processes of phagocytosis, limitation, fibrosis,

and functional repair than on a knowledge of the bacillus and the use of germicides. Many of the gravest diseases of the nervous system, such as cerebral hæmorrhage, softening and syphilis, might be more frequently prevented and more successfully treated were our knowledge of arterial degeneration and its relations to nutrition employed more practically. On the other hand, it is pathology that has taught the practitioner in great measure when he may hold his hand and allow spontaneous repair to proceed, as it occurs in acute pneumonia.

CHAPTER IV.

PRINCIPLES OF TREATMENT FOUNDED ON THE CLINICAL CHARACTERS OF DISEASE.

SEARCH FOR CLINICAL INDICATIONS

The clinical characters and course of disease complete its natural history. In the first place, the symptoms and signs constitute a great group of phenomena which present themselves in the living subject and suggest treatment. Secondly, it is in the clinical part of its history that the course or time-relations of disease can be best traced—its development, its progress, its duration, and the modes in which it terminates; all obviously calculated to furnish important principles for treatment. It will be convenient to discuss clinical indications under these two heads, kept distinct and apart from each other, namely, *Clinical Phenomena* and *Clinical Course*.

Therapeutical Study of The Clinical Phenomena of Disease.

Introduction.—Many of the symptoms and signs of disease are nothing more than phenomena, the living presentments or manifestations of deeper realities which we have discussed under the heads of ætiology and pathology—of the causes of disease, the pathological conditions and processes, and the associated disturbances of functions; and the indications to be derived from many of the most important symptoms and signs are identical with those which we have already reached in previous chapters. Some clinical facts consist of the actual causes themselves, such as a foreign body in the eye, a poison

that has been taken and vomited, a tape-worm found in the stools, tubercle bacilli discovered in the sputum. Other symptoms and signs are plainly the phenomena of natural resistance to pathogenetic influences, for example, the lachrymation, the vomiting, the purging, the expectoration, which attend these causes respectively. It is unnecessary therefore to say much in this place of the indications furnished by clinical manifestations of the causes of disease, which have been already discussed under their own head.

In the same way many clinical phenomena are simply the objective manifestations of pathological processes, partly destructive, partly constructive. On the one hand, we meet with a tumour, a gangrenous area, or the signs and symptoms of dilated heart; on the other hand, with the evidences of reaction and repair in a wound, or the signs and symptoms of cardiac hypertrophy. The therapeutic principles derived from facts of this order call for no further notice here.

But, when all this has been said and duly regarded, it is obvious that there remain many clinical facts which afford information and possess a value of their own to the therapeutist, and require careful study in our search for principles of treatment. They constitute, in the first place, the *living relations* of pathological processes. They reveal them actually at work: they are the occurrences, incidents, or effects of disease. *Post mortem* we recognise certain evidences of asphyxia; clinically we witness the very events of it. The clinical characters of disease introduce us to facts which the ætiologist and the morbid anatomist have no opportunity of observing —the many specific disturbances of an organ which attend disease of it, in addition to tissue change; for example, paralysis in cerebral embolism; anuria in acute renal congestion; palpitation, faintness and unsustained pulse in aortic incompetence; vomiting and headache in meningitis. A pathologist, examining the lungs and other viscera after death from bronchitis, could assert that there had been dyspnœa; but not that it took such and such a type: this could be determined only by physical examination during life. Neither would he find evidence of the necessity of sustaining the muscles of respiration and preventing the dulling effects of

asphyxia. The indications drawn from facts of this order add fulness and clearness to those derived by investigation of morbid causes, conditions and processes in the laboratory and post-mortem room.

In the second place, a large group of *independent* clinical facts present themselves for study in connexion with the principles of treatment, namely those which possess, as far as we know, no obvious pathological characters of any kind. Such are, in particular, the temporary disturbances of the primary physiological functions, which either constitute trifling illnesses of themselves, or occur as systemic accompaniments of local diseases—anorexia, fever, prostration, pain, urinary disorders, glycosuria, delirium, insomnia, palpitation, vomiting and the like. Other clinical phenomena are symptoms of the treatment which is being employed—of unsuitable diet; of medication, which, whether suitable or not, deranges certain of the organs (morphine for example); of inefficient nursing; and so on: that part of the practitioner's difficulties which is of his own making.

All these facts are purely clinical, the phenomena of active, sentient organs, which can be appreciated only during life: and they may be expected to furnish therapeutical indications of an entirely new order and of great value. Our search for principles of treatment in the phenomena of disease may be confined therefore to the two orders of symptoms and signs which we have found to be purely clinical: in other words, which can be observed only in the living body. In entering on this enquiry we must keep the object of it clearly before us, namely, the therapeutical application which we intend to make of the results. In particular we shall enquire whether these clinical phenomena are always manifestations of the destructive factor of disease and not sometimes significant of further processes of natural recovery which might be turned to practical account. For this purpose it will be necessary to examine many clinical phenomena, taking, however, only the principal symptoms and signs of disease as types, employing them as illustrations of the whole, and grouping them under two heads, namely (1) Pain and other kinds of Distress, and (2) Disturbances of Functions — obviously two groups

only, not classes, of clinical facts, employed for our present convenience. We shall begin with pain as being the most important clinical fact with which we are at present concerned, both because of its urgency and of the light which it throws upon the principles of rational treatment.

Pain and other kinds of Distress.—Pain and other kinds of distress, such as sense of illness, of exhaustion, of want of breath, of præcordial anxiety, etc., have a peculiar significance in relation to treatment. In the first place, they are of themselves unfortunate, troublesome and injurious: evil in their effects on the patient, breaking his rest and sleep, robbing him of appetite, depressing all kinds of functional activity, aggravating local disease, and accelerating exhaustion and death. They are, however, of deeper import than this. They are evil in their *origin:* an evidence of ascendency of the destructive factor of disease; of something wrong, going wrong, doing badly; of want of success (temporary or altogether) in natural recovery or in the treatment that is being employed. "When I hurt a patient," says Professor Chiene, "I always feel I am doing or have done wrong."[1]

But whilst pain and all kinds of suffering are thus evil in themselves and in some of their effects, they have other effects which are actually conservative. They prompt or originate acts of relief; and relief promotes repair and recovery. Thus pain has been regarded by some authorities as a natural means of recovery. This subject calls for close examination.

The facts that reveal to us the significance of what we may call "pain" (which we shall take as an illustration of all kinds of distress or suffering connected with disease) are of two different orders, negative and positive.

Negatively, the danger of the absence of pain in disease, of "latency," of "disease without symptoms," is recognised. Abscess originating in the spine, empyema, and pulmonary tuberculosis occur to us at once as instances of grave affections which are frequently overlooked until they have reached a serious degree or are beyond repair, mainly from being unattended with pain. The presence of pain in such cases would have prompted the sufferer to seek assistance earlier.

[1] *Brit. Med. Journ.*, London, 1891, vol. ii. p. 237.

Positive facts bearing on this subject are equally suggestive. Injury and disease are attended with pain, which is no doubt the subjective manifestation of a peculiar, special cerebral disturbance. The pain (or its cerebral basis) impels muscular movements of the affected part or of other parts. Some of these movements happen to relieve pain; a position of comfort, once found, is preserved by maintaining the muscular action; relief continues; rest is obtained; repair proceeds. In this way muscular contraction arrests the pain set up by passive movements, jolting, shaking, pressure, etc., in connexion with fractures, dislocations, pleurisy, peritonitis, and the like; and the effect of pain is rest.—In another and larger class of cases muscular relaxation is compelled by pain, and happens to secure relief for an injured or diseased part. This is maintained; the least departure from it inducing return of distress. Certain postures and cubitus, familiar amongst the symptoms and signs of injury and disease of the chest, for example, originate in this way, and are wholly salutary. Here also the effect of pain is rest. In both instances the chain of events which begins with pain and ends with rest involves also involuntary or automatic mechanisms. Indeed the muscular movements which secure relief, rest and repair are usually purely reflex—in peritonitis, for example—directed by impressions from the affected part.[1]

Besides rest there are other effects of pain which promote relief and favour recovery. Pain automatically prompts rubbing, pinching, pricking and different forms of local irritation, "counter-irritation," of the affected part. The school-boy shakes or beats or firmly grasps his hand when it is struck by a cricket-ball. The child puts its finger in its mouth. Other forms of relief are uncontrolled bodily movements, cries and tears. All are believed, and on sufficient evidence, to "do good."

We thus see that pain has certain effects which are of service in themselves and which are highly suggestive to the therapeutist. First and chiefly, it compels attention to disease and prompts intelligent and automatic efforts to obtain

[1] Hilton, "On Rest and Pain," 1877; Gowers, "Diseases of the Nervous System," vol. i. p. 70.

relief, and thus promotes recovery which might not have occurred in its absence. Again, the fear or dread of pain, once it has been felt, serves to stimulate and strengthen resistance or avoidance (prevention) in the future. Suffering is also the basis of sympathy, on which treatment and the care of the sick finally rest. Pain is therefore at once an incentive and a guide to us. In other words, it is not always reasonable to complain of pain and other forms of distress. A man who for twenty years has been the subject of compensated disease of the mitral valve, "complains" at last of præcordial pain and palpitation, when in truth these are nothing else than the dumb protest of an organ that has worked bravely in spite of structural disability for years until worried, abused, and exhausted by the further evils of alcohol and tobacco. The pain and palpitation are this man's best friends.

It is not difficult to understand how it has come about that pain and its allies are regarded by some authorities as part of an automatically working arrangement which promotes recovery. This view, however, must be very carefully entertained. In itself pain is evil. It cannot be described as "intended" to promote recovery. To say that the use of pain is to secure its own relief is nonsense. If the *rôle* of pain were that of a danger-signal, it would not be absent in some of the gravest and most insidious of diseases, such as chronic nephritis; nor would it be present in some diseases such as cancer, where it is utterly useless up to the moment of death. It is a wholly unfortunate attendant on many surgical proceedings. The true relations of pain to treatment therefore are: (1) that it is a valuable *index* of the activity of the destructive factor of disease, of need of arrest of this activity, and occasionally of the direction in which relief is to be afforded; (2) that it is in itself unfortunate, unfavourable, and—provided its lessons are understood—unnecessary. In a word, pain is something to be respected, but to be prevented and arrested on every possible occasion.

These relations of pain and other kinds of suffering to disease, relief and recovery are, after all, not special or peculiar. Like the other facts which we have studied in connexion with the spontaneous prevention and arrest of

disease, they fall within the range of physiology. They are parallel with the relations of hunger and thirst, for example, and with faintness and exhaustion.

Indication.—A very important indication can be drawn from this study of pain, namely, *to relieve distress and avert danger of every kind;* but in doing so to let treatment, even when purely palliative, be guided by consideration of the significance of the pain or other kind of disorder which calls for interference, and subordinated as fully as possible to more fundamental principles. The practitioner who has trained himself not to order treatment in any case without deliberately having ascertained, or tried to ascertain, the different indications for it which are to be found in a study of the natural history of the disease, will be best able to resist the temptation to relieve pain directly in a routine fashion, and will most surely subordinate palliative treatment, when it is indispensable, to more profound considerations. If he follow this principle, his methods are likely to prove far more beneficial than indiscriminate relief. Pain, for instance, becomes really of use to him when dealt with in this way. He appreciates its significance as well as its existence, and he usually can employ a far wider range of measures for combating it than the habitual anodynes which first suggest themselves.

Disturbances of Functions.—Disturbances of function, whether of the affected part in local disease, or of the great primary functions—alimentary, circulatory, respiratory, nervous, metabolic, excretory, etc.—are of various significance. Many of them are unquestionably of the nature of impairment, of something discharged imperfectly or indifferently or at a stand-still, or of something positively injurious to the blood and system as a whole—paralysis, cyanosis, faintness, jaundice, anuria. These are evil. Collectively they help to exhaust blood, strength and courage, and make for death. At the same time, certain of their effects, like those of pain, prove to be beneficial indirectly. The acts which they prompt have this result. Exhaustion compels rest. Anorexia often prevents harmful feeding, and no doubt ought to be respected more than is the custom at present.

Other disturbances of function in the course of disease appear to be wholly beneficial in their significance. Thus increased arterial tension in lithæmia and Bright's disease is not strictly a morbid phenomenon, but an evidence of healthy reaction to a morbid state which it meets and compensates by promoting diuresis and excretion. Of similar significance is the increase in force of the heart which is associated with the rise of arterial pressure under the same circumstances. The ventricle reacts to the increased peripheral resistance with increased force, and overcomes it. Thus neither of these phenomena is a manifestation of the destructive but of the conservative factor of disease. Together they have the effect of increasing the flow of urinary water and therewith the excretion of nitrogenous waste. Something is being relieved or put right, not going farther wrong.

Other familiar instances of spontaneous relief ordinarily included among "the symptoms of disease" are the dyspnœa (hyperpnœa) of bronchitis, and the dyspnœa (tachypnœa) of acute pneumonia. The dyspnœa which we regard with concern and treat may be a measure of the disease or disorder present; but it is strictly conservative, not morbid; the disease itself and the want of oxygen, not the increased respiration, require treatment. Dyspnœa has a similar effect for good in cardiac failure; and, conversely, acceleration of the heart, ominous although it may be, is beneficial in acute pneumonia and other diseases of the lungs. The remedial effect of fever as a whole is maintained by some authorities; though more probably it consists, like the rest, of a destructive and a conservative factor. Reflex salivation in dyspepsia neutralises hyper-acidity of the stomach automatically.[1] Vomiting and diarrhœa are generally regarded as salutary effects in uræmia.

Thus the conclusion at which we arrive with respect to the functional disturbances met with in the clinical study of disease is that they are not always evil and to be corrected. Occasionally they are significant of attempts, indirect or direct in different instances, at relief and at maintenance of life, and they may be regarded then as indi-

[1] W. Roberts, "Digestion and Diet," 1897, p. 256.

cative both of the need of assistance and of the method to be employed.

Indication.—The indication to be drawn from these considerations is obvious: *to respect and control the functional disturbances connected with disease, relieving disorder and promoting intelligently natural provisions for relief,* the significance of the disturbance in each instance, and at the particular time, being ascertained and appreciated, if possible, before action is taken.

Forms and Methods of Natural Relief and Indications derived from them.

Instead of examining in detail the many other clinical phenomena of disease with which we are familiar, we shall now attempt to arrange the principal methods of Natural Relief under distinct and definite heads. The most important of them we have already seen; a few others, as well as fresh illustrations of this provision, will be more conveniently and profitably studied in the proposed order.

Rest.—Of all methods of automatic relief, which conduce at the same time to resistance and recovery, the one most generally acknowledged and respected is Rest. Rest indeed proves to be a valuable guide in practical medicine, as well as a precious means of treatment when proper advantage is taken of it. The subject calls for somewhat lengthened discussion.

Kinds and Degrees of Rest.—Some clinical phenomena are evidences of physical rest; others of physiological rest. Spontaneous physical rest—the absence of even passive movement and mobility—is seen in fracture fixed by callus. Spontaneous physiological rest—the absence of functional activity (muscular, vascular, nervous, secretory)—is illustrated by the relief afforded to the iris and retina by involuntary closure of the eyelids in intraocular inflammation, and the comparative arrest of the digestive juices which attends gastric catarrh. The term "rest" is commonly applied to relative as well as to absolute inaction: to performance of

less work as well as to complete cessation of work. The heart rests when diastole is lengthened and the pulse is reduced in frequency. Pain in the side compels rest of the muscles of respiration. Rest of this relative kind may be effected by an easier distribution of the rhythm of work and relaxation. The stomach is rested by being called upon to do very little work at short intervals; and it is the rule in acute illness for a considerable amount of sleep to be obtained in repeated snatches.

Origin of Rest as a Method of Automatic Relief.—We have already studied the origin of rest in pain and distress. We need say no more in this place on the consensual avoidance of pain and the effect of it in securing rest.[1] The loss of the feeling of being well, strong, and "fit," and the sense of illness and debility attending disease, produce indisposition to work and a desire to be let alone and be at peace. The degree of rest to which an invalid resigns himself—sitting, reclining, lying, confinement to bed—steadily increases with weakness. Recumbency is the natural posture in serious illness, speaking broadly; it insures the maximum amount of rest to the muscles and circulation, and promotes sleep. Rest is also automatically induced by general fatigue and the accumulation in the system of the effete products of disorder and disease. This result is the parallel of that produced by the fatigue of muscles and brain which leads to sleep. Local fatigue contributes to rest diseased joints.[2] In the third place, rest is occasionally secured by means of nervous or muscular action. This paradoxical effect is seen when complex unequal muscular contractions set a broken bone perfectly at rest.[3] Finally, rest is effected locally in some instances by the occurrence of extravasations and effusions and inflammatory products generally. This is observed in connexion with sprains and other injuries, and in inflammation; synovial and serous effusions being particularly striking as agents of rest.

How Rest acts.—The most obvious effect of a beneficial

[1] "In the more intense forms of arthritis deformity of the joint is . . . evidence of Nature's attempts to secure rest for the articulation by fixation of the joint." H. O. Thomas, "Contributions to Surgery and Medicine," 1883, pt. ii. p. 8.

[2] Kent Spender, "Osteo-arthritis," p. 39. [3] Thomas, *op. cit.* pt. ii. pp. 8, 9.

kind which rest produces is relief. The broken thigh or rib, the inflamed pleura, the rheumatic joint, the ulcerated stomach all cease to ache when the respective part and the body as a whole are at rest. Thus relief of pain and rest reciprocally favour each other: rest insures relief; relief promotes rest. Rest has also certain physical effects. It permits contact and adhesion of the parts in fractures, promoting reunion; and it prevents aggravation of these and other lesions. It promotes adhesion in inflammatory processes, preventing perforation and insuring limitation otherwise. It favours coagulation and closure of vessels in hæmorrhage. It removes pressure and stress on bones, tendons and ligaments, by removing weight from the affected parts. Again, rest prevents certain unfortunate effects of muscular action on injured or diseased parts, including the dangerous spasms which may complicate fractures, the cardiac excitement which determines valvulitis in acute endocarditis, the peristalsis of the stomach which interferes with the healing of gastric ulcer, and the bodily movements which loosen thrombi and lead to embolism and septicæmia. Another salutary effect of rest is to prevent or remove fatigue and exhaustion of the nervous and muscular structures in connexion with disease. The fact is so commonplace that it is frequently ignored, yet in acute disease of a severe type, and in chronic disease accompanied by exhaustion, existence may be dependent on the maintenance of complete rest in bed. A fact of much importance in relation both to repair and relief is that rest reduces the activity of the circulation as a whole and in the affected part. In other ways we find that rest is closely associated with nutrition. It favours anabolism —indeed it appears to be essential to it. It is a necessary condition of extraordinary anabolism as it occurs in growth, development and adolescence. Locally it promotes repair. At the same time it checks excessive katabolism caused by the destructive factor of disease, for instance in inflammation, ulceration and fever.

Failure of Rest as a Method of Natural Recovery and Relief.—We must now enquire whether rest ever fails, like so many of the methods of spontaneous resistance and recovery. Unfortunately, there is plenty of evidence of this.

First, rest is often a physiological impossibility, or at best but incomplete. Sometimes also we find the muscular movements that ought to secure rest in such conditions as fracture miscarrying and ending in spasms, which aggravate the distress, increase the lesion, and render the condition as a whole worse than it was at first. In other instances rest fails to be secured by its own mechanisms. It may fail even from excess of the fatigue which prompts it, that is, from exhaustion. The overtired child is restless and fretful and cannot sleep. The excited brain often seeks relief in work. The respiratory centre, exhausted by irritation of the air passages and by lack of oxygen, falls into a condition of restlessness, and ceaseless cough is the result. The gastric centre, taxed by severe and protracted stimulation from the stomach, bowels, uterus, or kidneys, lapses into a similar state of "irritable weakness," and the vomiting, although now entirely useless, becomes uncontrollable and possibly ends in death.

Secondly, when rest has been secured, the result of it may be unfortunate. The effects of local rest may be carried to excess. Joints become stiff or ankylosed, and therewith they undergo depravement of functions — their muscular and nervous capacities, their synovial secretion, their vascular action and the cellular nutrition of their tissues.[1] A lung compressed by pleuritic effusion enjoys the advantages of rest during the acute phase of the disease; but only too often it remains condensed and practically obsolete. Too often, also, whilst rest is being secured to a diseased or injured joint the neighbouring structures are subjected to changes of a damaging kind: the local circulation in the limb may be arrested and gangrene result. In the pleura, as we have just observed, the inflamed structures are set at rest by means of effusion, but respiration is imperilled; whilst the heart is in even greater danger here, as well as in pericardial effusion. The effects of general rest also, valuable though they be, are in part unfortunate; and general rest is readily carried to excess either in degree or in duration. Protracted bodily rest favours inaction of the liver and bowels, and of the respiratory and

[1] These evils appear to have been exaggerated by some writers. See Thomas, *op. cit.*, part ii. pp. 6 and 35.

circulatory systems, which readily ends in derangement of health. The appetite flags in bed, digestion becomes weak, the motions are found to be pale and costive, the urine is thick and scanty, the mind becomes depressed and irritable, tonus is lowered in the muscles of the lower limbs and back, and the body tends to grow inactive, flabby and fat. The products of metabolism, accumulating in the system, under these circumstances, induce a sense of weariness, languor, weakness and mental depression, which replace the feeling of exhilaration attending exercise and encourage further bodily rest and sleep. Thus a vicious circle is established: rest encourages further and more complete rest, whilst it depresses the bodily functions which favour and control sanguification and repair, and it often perverts the mental disposition of the patient, another effect inimical to recovery.

Regarded from the point of view of its effects, and tested by results, rest as a method of natural relief affords fresh evidence of the caution with which clinical phenomena have to be employed as guides to treatment. Sometimes rest is to be promoted, sometimes ended; in every instance its relation to the particular disease must be carefully appreciated before action is taken. Broadly stated, the indication may be said to be: *to insure rest to the body and to individual organs when they are diseased or disordered, but at the same time to control it.*

Protection.—Voluntarily and involuntarily the sufferer protects himself from interference that is likely to cause or increase pain, or he shows his anxiety to do so by his expression or his cries. Independently of these more or less deliberate acts, we have familiar symptoms and signs of similar significance which are purely automatic. Such is the meaning of muscular hardening of the abdominal walls, in whole or in part, under the hand, in acute peritonitis and other painful affections of the different viscera. It is manifestly a sound as well as an elementary principle of treatment to relieve distress and control functional disturbance by protecting the patient against circumstances, conditions and interference which would cause or increase them.

Unfortunately, automatic protection is but an imperfect and limited method of relief. There are but few parts of the

body that can be protected automatically in disease, and but little success attends the method in severe illness. Occasionally it misses its mark by being excessive. Protective blepharospasm, for example, prompted by photophobia, may demand an operation for its relief;[1] spasm of the larynx and bronchi in association with inflammation of the respiratory tract contributes fresh suffering and danger. Under such circumstances there is a plain indication: *to assist the method when it is deficient and to control it when it is excessive.*

Reaction.—Some symptoms and signs of disease prove to be manifestations of reaction to the destructive factor. Such is the significance of the rise of the arterial pressure in lithæmia; of the increased cardiac action under the same circumstances ending in hypertrophy of the heart; of hyperpnœa in chronic bronchitis, ending in hypertrophy of the muscles of respiration. In acute pneumonia the serious deficiency in the contact of oxygen and blood is prevented by the functional reaction of the respiratory mechanism in the shape of increased frequency of respiration (tachypnœa). The refinement of adaptation of the respiratory mechanism under the stress of disease is indeed even greater than this. Not only are the force and frequency of increased respiratory action (dyspnœa) automatically adapted to the necessities of the particular case through the respiratory centre and its connexions, but the distribution of the respiratory movements is modified according to need. The one side of the chest, or portions or areas of the one side or the other, may then be found to display exaggerated movement or the reverse; or the breathing will belong to the upper-thoracic, costal, or diaphragmatic types as circumstances demand. In these instances again we have signs or symptoms which are not strictly phenomena of the diseased organ or diseased parts of the organ, but of physiological action increased or otherwise modified in accurate adaptation to the particular necessity of the unaffected or handicapped parts of the organ, the affected parts being at the same time relieved and enabled to rest.

We learn, by the way, from these considerations the same lesson as we have learned from the beginning: that spontaneous,

[1] Brudenell Carter, *op. cit.*, vol. i. p. 669.

automatic, natural relief is simply a physiological necessity—the outcome of the strain of physiological mechanisms in association with morbid processes.

Automatic reaction as a method of relief proves, like the rest, to have its weak side. It is often imperfect, costly, or calculated to afford only temporary relief. High arterial pressure may cause headache; if vasomotor tension and increased cardiac reaction persist, they will end in cardio-vascular degeneration and hæmorrhage. Hyperpnœa makes a heavy demand on the respiratory muscles; and if it continue indefinitely, it will end in deformity of the chest.

The therapeutic lesson which we learn from this study is patent: *to promote such functional disturbances as are of the nature of beneficial reaction to the morbid process, and to sustain the organs—particularly the heart, vessels, respiratory muscles, and nervous system—on which the strain of reaction falls.* In every instance intelligent consideration must be given to this method of natural relief; and if necessary *it must be controlled.*

Readjustment.—The natural relief afforded by fever is to be regarded as a method of readjustment. The dilated vessels of the integuments, the sweats, the increased frequency of the pulse, the quickened breathing, and the elevation of the body-temperature to a higher level—say 103° instead of 98·4°—are automatic means of cooling the body. Yet fever, with all its immediate benefits, is an exhausting process. So the variations in the frequency of the pulse and heart which we count so carefully in every case of acute illness are beautiful instances of automatic regulation and relief in the way of readjustment to the rise or fall of arterial tension; but the gain is not always so great as appears at first sight. Rise of frequency of the pulse counter-balances low tension, but it means increased expenditure of cardiac force under precarious circumstances; and if it continue, it is universally accepted as an unfavourable symptom. Therefore, whilst it is an indication based on sound principles *to promote natural provisions for functional readjustment, and to copy the method in other ways and under other circumstances, we must be prepared to control and sustain the mechanisms by which it is effected.*

Vicarious Action.—Vicarious action is recognised as an

automatic means of relief possessed by the bodily organs. Some of the most familiar clinical phenomena support this view, and accordingly are to be regarded as manifestations of the conservative factor of disease and not essentially morbid. The skin and kidneys are reciprocal organs in respect of elimination; and when the perspiration fails in renal inadequacy, even the stomach and bowels appear to come to their assistance in the excretion of urinary products, the result being salutary vomiting and diarrhœa. There is no difficulty in accounting for this interesting fact. Excrementitious matters in the blood are ordinary physiological stimulants of the kidneys, skin, and alimentary mucosa (probably also of the respiratory surfaces); and should one or more of the usual channels of elimination be blocked, the others are subjected to increased stimulation (strain) and respond vicariously. In a precisely similar way organs that are inseparably associated with each other in a complex physiological function necessarily relieve each other in distress, that is, in disease or derangement. The bowel completes the digestive process in gastric dyspepsia. The force and the frequency of the heart rise in respiratory difficulty as we have seen, and the force and frequency of the respiratory movements rise in cardiac failure, for the associated function of the respiratory and circulatory systems is oxygenation of the blood and tissues.

Whilst the value of vicarious help to an organ, whether it be acutely impaired or permanently incapacitated, is recognised by the clinical observer, he is always careful to estimate the essential weakness and the occasional failure of this method when spontaneously displayed and left to itself. It originates in weakness. What is equally unfortunate as regards its effects, a second organ or set of organs is involved by it in difficulty, taxed, and perhaps damaged by the strain of the unusual demand upon them. Vicarious help ends in a vicious circle. One of the chief dangers of acute pulmonary disease is failure of the heart, referable in part to its vicarious action in favour of the lungs. The vomiting of uræmia, immediately salutary although it be, is often a distressing and costly process, and may be the immediate cause of death.

The practical conclusion to be drawn from this analysis is

that *vicarious action of one organ in favour of another is to be promoted, and the method to be followed as a valuable therapeutic proceeding.* At the same time means must be taken *to sustain the organ* thus subjected to functional strain.

Diversion.—In our study of the significance of pain, we had occasion to refer to certain automatic or reflex acts for its relief which are familiar to us in man (and, we may add, in the lower animals also), namely, rubbing, scratching, striking, pinching, sucking, etc. Acts of this kind and other symptoms of an allied character are not strictly morbid but the reverse. They are obviously prompted by local irritation, originating in diseased, injured or disordered parts. This produces sensations of pain, itching, numbness, heat, etc., in the sensorium, and is at the same time reflected in the form of rubbing, etc., *i.e.* counter-irritation. The second irritation of the local nerves, that from the surface, relieves the sensory effects of the first; often very quickly. This natural method of relief is a kind of diversion: the attention of the sensorium is directed or distracted, as it were, from an unpleasant to a pleasant or at least a new impression. A similar method is at work in connexion with distressing impressions of a higher or psychical kind. The value of diversion is easily studied in the child, and the practitioner is acting on strictly rational principles when he takes advantage of it on every occasion in his young patients. The most trivial thing will often relieve distress in these subjects—a strange sound, a toy, or a little tale about some part of the body well removed from the seat of the disease. Light occupation, amusement or change of scene is often equally successful and scientifically indicated as a means of relief in adults, by claiming attention and thus enabling them to "forget their troubles," at any rate for a time.

Summary: General Principles; Value of Clinical Indications; Practical Applications.

A general survey may now be taken of that portion of the natural history of disease which is studied as clinical phenomena, including the principles of treatment which have suggested themselves.

It appears that whilst the clinical phenomena of disease are mostly manifestations of distress, disability and impairment, it would be a grave error to regard all of them as evil, as expressions only of the action of the pathogenetic influence, of the destructive factor of disease, and of the disorder and danger which attend it. On the contrary, many clinical phenomena are evidences of the workings of resistance and of recovery; and other symptoms and signs have no meaning apart from spontaneous attempts at relief.

These provisions for relief, however, are far from being sufficient. Disease, as the word itself implies, is essentially attended with suffering. As a class the provisions for relief appear to be inferior to the provisions for resistance and recovery. Again, some of them readily become excessive and exhausting; in many instances they are called into action only by means of pain and other kinds of urgent distress. Still, an *attempt at relief* is often, perhaps always, made.

Cardinal Conclusion.—We thus reach a third conclusion of cardinal importance in general therapeutics: *that the body possesses, in addition to provisions for Resistance and Recovery, provisions also for spontaneous Relief. Relief, however, often fails to be attained in this spontaneous way.*

There is therefore abundant evidence in the clinical phenomena of disease that therapeutical assistance is required to relieve distress and remove disorder; and at the same time that openings or opportunities for therapeutical interference are constantly presenting themselves. Fortunately, the means of affording help are powerful and of great variety. By medicinal and non-medicinal measures we have remarkable control of the physiological actions of the body. Indeed, as we shall see presently, danger lies in the other direction—in the abuse of our position by indiscriminate interference and unnecessary recourse to powerful remedies.

Value of Symptomatic Indications.—The principles of treatment derived from a study of the clinical phenomena of disease possess certain advantages and certain disadvantages as guides. They are of particular value because they enable us

to deal rationally with distress, which is very common, often urgent, always unfortunate and undesirable in itself, and in many cases the principal condition claiming attention. Symptomatic indications have also the advantage over ætiological and pathological indications that they are obvious and can be ascertained by simple observation. Further, symptoms and signs can be readily watched in their development and changes, as the pulse for example is watched in fever, and are thus accurate indices of the condition of the body and of the effects of remedies.

On the other hand, symptomatic indications possess many serious disadvantages, and indeed symptoms become dangerous guides when indiscriminately followed. This aspect of the subject is practical in its bearings, for it is in its clinical relations that disease directly concerns the practitioner. The phenomena present themselves to him, and with them and his use of them his plan of treatment begins. They are numerous, patent, highly suggestive of interference; they are yet at the same time but manifestations of the actual disease which underlies them, or of attempts by the body at spontaneous relief. There is great reason therefore that they should be employed with discrimination as guides to treatment, and never without due consideration. Indeed it is clear from what we have seen that clinical phenomena might be unsafe as direct indications for treatment, *i.e.* without reference to their origin and meaning. Let us study this point carefully.

It must never be forgotten that the chief use of clinical phenomena is to make a diagnosis. They are to be regarded as symptoms or signs in the proper sense of the words: that is, as symptomatic or significant of a pathogenetic cause and a pathological process which are at work; to be interpreted as far as possible into ætiological and pathological facts, from which indications for treatment may be drawn and by which therapeutical results are to be tested. Thus hæmoptysis in mitral stenosis suggests much more than arrest of the alarming bleeding. We discover in the hæmoptysis, dyspnœa and cyanosis, as well as in the pulse and different physical signs, the living evidence of a morbid condition with which we are

familiar—an obstructed mitral orifice, a weak cardiac wall, a distended left auricle, and an engorged pulmonary circulation and venous system. A clear mental picture of this condition furnishes us with a pathological indication—to relieve a failing and dilated heart: and we fulfil this indication and relieve the *disease* (the dilated heart) as well as the *symptom* (the hæmoptysis) by bleeding the patient. Properly regarded, insomnia indicates in one case a cardiac stimulant, in another case a cerebral sedative, in a third instance just as unmistakably a course of treatment directed against gout or against syphilis. Pain is a manifestation of some pathological condition which has first to be determined if possible and then to be righted: it is not a something existing independently, to be treated under all circumstances, and in whatever situation and subject, with another something called an anodyne which kills or covers it. Before the treatment of diarrhœa in phthisis can be properly planned, the "symptom" must be traced either to enteric catarrh from injudicious feeding, in which case it ought not to be abruptly stopped but intelligently assisted; or to intestinal tuberculosis; or to amyloid disease, or to some other pathological state of a definite kind. In typhoid fever we are taught to ask ourselves whether diarrhœa is a natural and beneficial method of removing the products of the pathological process and therefore to be permitted, or a manifestation of injudicious feeding, or due to other cause. Unnatural return of pyrexia in the same disease is traced to excitement, premature feeding, constipation, etc., under which circumstances it calls for more careful nursing, not for phenazone. The dyspnœa of bronchitis is differently regarded as an indication for treatment from the dyspnœa of pneumonia; and the cough of the same two diseases is interpreted as entirely unlike in significance, and to be rationally dealt with in entirely different ways. It is obvious that if this course be observed, treatment will be founded on indications determined by the interpretation of the clinical phenomena as symptoms, signs (*signa*), manifestations or evidences of pathological states and processes, destructive and constructive, and of the causes of them; and will be directed not to the phenomena but to the deeper realities. As for the many clinical phenomena which are significant of natural relief in

different diseases, not of suffering or disorder, plainly they call for help instead of interference.

The second therapeutical use to be made of clinical phenomena is as direct guides to the employment of means of relieving distress and disorder and averting danger for their own sake. Relief stands out prominently as the chief end of the conservative factor of disease in its purely clinical aspect, and proves to rank in cardinal importance with Resistance and Repair. The direct attention to suffering which is thus indicated on scientific grounds is also prompted by humanity and common-sense. Pain, fever, sleeplessness, cough, diarrhœa, dyspnœa, are examples of disorders for which remedies are daily prescribed. Whilst such individual symptoms are mainly to be regarded therapeutically as manifestations, they are not to be ignored or despised as being of no therapeutic importance compared with the disease proper. Next to the very common error of attending too much to symptoms—the abuse of symptomatic treatment, which will be discussed presently—is the mistake frequently made by young practitioners, fresh from the study of pathology, of treating only the disease, overlooking at the same time the fact that many clinical phenomena demand attention as disturbances of function—on the surface, as it were, of the disease proper, and so far inessential to it. The preparations made at the beginning of treatment to promote the comfort of the patient, to protect him against the distress and possible danger of movement, exertion, exposure, etc., to prevent disturbances of alimentation, elimination, and the other primary functions as far as possible—in a word, much of the routine of what is commonly called "the general management of the patient"—comes under this head. Nursing is largely concerned with it in a methodical, organised or skilled way. Attention to derangements of digestion, constipation, disordered action of the liver and the like, by means of simple remedies (directed in accordance with the pathological indications) is always required; and here we may once more repeat that many of these and other "symptoms of disease" are of the practitioner's own making—symptoms of his treatment and not of the disease itself. In the present state of medicine a great part of the

success that attends treatment is attained by relieving the disturbances of function superadded to the primary disease, possibly grave, possibly hopeless, in itself; and by being careful not to induce them. Anæmia, paralysis, pruritus, debility are thus "treated" whatever the primary disease may be. Indeed the derangements of function set up by a disease may be far more important immediately than the pathological process itself. Dysphagia attending œsophageal cancer demands more anxious attention than the malignant growth. If obstruction of the bowels be counteracted by colotomy, a patient may live for many months with carcinoma of the rectum: it is the intestinal disturbance that threatens his life at first. The pain and other discomforts attending chronic pyelitis may be immediately, completely and permanently removed by regular evacuation of the bowels; and the case may do far better on no treatment beyond mild purgation than on attempts to influence the pelvis of the ureter with drugs.

It will be obvious, however, to the most inexperienced that this importance need not be attached to every clinical phenomenon; indeed that it might not be wise or even safe to treat all phenomena indiscriminately. It is imperative to relieve some symptoms, particularly violent pain. It might be foolish, because unnecessary, to attend to others directly, such as acceleration of the pulse, a coated tongue, or even pyrexia, which has been so greatly regarded as calling for repressive treatment during recent years. It would be dangerous to interfere with cough or dyspnœa in bronchitis.

Let us consider under what circumstances the "relief of symptoms" might fairly claim direct attention.

In a certain number of instances the urgent and critical condition of the patient forbids the loss of time involved in an examination. Syncope, asphyxia, convulsions, hæmorrhage, severe pain and other symptoms of danger or unbearable suffering must be treated immediately, without regard to a diagnosis. Indeed the symptomatic indication is often to be attended to first, however clear and promising the pathological indication. An urgent case of cardiac dropsy may call for a hypodermic injection of strychnine to support the heart before we proceed to prescribe the digitalis which is rationally indi-

cated by the dropsy and other evidences of ventricular failure. This illustration suggests a second set of circumstances in which symptomatic treatment is justifiable and indeed the only proper and possible line to follow, namely, when considerable time is required for radical measures to come into action. It may be the third day before digitalis begins to display its diuretic influence in cardiac dropsy; and during this time swiftly-acting stimulants like ether, ammonia and strychnine have to be given to sustain the heart, and smart purgatives to maintain excretion.

In other instances "relief of symptoms" is the only method of treatment that is possible. No other, no more rational treatment is possible because the pathogeny of the disease is unknown. The nature of Graves's disease is still undetermined, and the indications for the treatment of this complaint are purely symptomatic. Even the pathological significance of its individual phenomena is unknown—the tachycardia, the proptosis, the worrying disposition, the diarrhœa. All that can be done, as far as these phenomena are concerned, is to recommend galvanisation of the neck and præcordia, rest of mind and body, and remedies calculated to quiet the nervo-muscular mechanisms of the bowels. In a somewhat similar way the practitioner of medicine is constantly being driven to employ "symptomatic treatment," at least temporarily, in consequence of the difficulties of diagnosis (particularly at the commencement of diseases) and of his inability to determine the pathological significance of phenomena. Headache, for instance, demands treatment, possibly for several days, before the practitioner can say whether it be due to typhoid fever or to tuberculous meningitis. It may be impossible to determine at first, or indeed at all, the origin of a hæmatemesis which threatens to prove fatal. Hæmoptysis occurs in a variety of pathological conditions, and it may not be permissible to attempt to discover by physical examination which of these is present in a given case before us; but we must do our best to treat it for its own sake.

Not infrequently relief is the only method of treatment that is practicable. In many instances the ætiological and pathological indications are perfectly clear but cannot be

fulfilled from want of means. Ordinary pulmonary tuberculosis is an obvious example of this difficulty. In other instances the condition may be hopeless from age or similar circumstances, and death unmistakably approaching. Other than symptomatic treatment—operations for example—would serve only to accelerate the end. In cases of this class and of the preceding class symptomatic indications are followed simply because there is nothing better to be done.

Lastly, the systematic therapeutist recognises that it is exceptional to meet with a case in practice in which treatment has not to be directed, at some stage or other, to the relief of symptoms as well as against the morbid process. We are often compelled to control the cough, sweats, and pains of phthisis whilst we are directing our management to check the tuberculosis as a whole. And it is the same with most diseases, grave or trifling, acute or chronic.

At first sight we appear to have landed ourselves here in a conflict of clinical indications. The first great principle which we have reached is to employ clinical phenomena for diagnostic purposes and direct our treatment to pathological conditions instead of the mere phenomena of them; our second great principle is to relieve the symptoms themselves. It is certain that both principles are founded on natural provisions, and are therefore sound. How are they to be harmonised? Unquestionably this is a real difficulty in practical medicine. It introduces us to one of the most important enquiries in general therapeutics—as to the proper place or province of direct symptomatic treatment; the difficulties and dangers connected with its employment; and in particular how far the practice of it is open to abuse. We must discuss this subject with particular care.

Direct Symptomatic Treatment.—As we have already seen, suffering is in itself evil. It is something to be prevented or arrested on all occasions. If there were no other considerations than relief in that part of treatment which is based on symptoms, therapeutics would be comparatively simple. It would also be a successful art, as far as the immediate result is concerned, inasmuch as we possess large numbers of powerful remedies calculated to fulfil this indication—anodynes,

hypnotics, cardiac stimulants, carminatives, etc., which have been cultivated long and diligently. Unfortunately the very urgency, obviousness, simplicity, and immediate success of symptomatic treatment of this order are constantly tempting us to abuse it. They constitute elements of danger in the method. Experience soon teaches the young practitioner—confirming what theory suggests—that to blindly follow this system, to interfere or meddle with symptoms indiscriminately, lands him in endless difficulties. These may be now comprehensively reviewed.

Indiscriminate attention to symptoms as such leads us to ignore or neglect the great principle which we have just established—that the proper objects of treatment are the conditions and processes of disease. Routine attention to distress tends to begin and end there—to the neglect of the pathological indications. Headache is treated with phenazone without enquiry into its cause. Then comes the temptation, and presently the disposition and practice, to relieve all symptoms, whether they be distressing or no, in a direct way, without ascertaining their significance—anæmia with iron, indigestion with pepsin, a coated tongue with purgatives, a soft pulse with alcohol, and so on.

On the practitioner himself the system or habit of direct attention to symptoms soon comes to exercise a baneful influence. It calls for the exercise of the lower or least advanced kind of professional knowledge. A tyro can order an opium draught for "diarrhœa": it demands attention, thought and experience, and it costs some time and trouble, to approach the phenomena properly and determine that the diarrhœa is significant of cancer of the rectum. To yield to promptings to routine practice of this kind fosters ignorance by perverting a man from the scientific method in which he has been trained. In particular it saps his knowledge of pathology. Symptoms are raised to the position of diseases; disease insensibly comes to be regarded as a name for a collection of symptoms. Cases presently are looked upon not as instances of certain pathological processes, but in respect of what the patients are taking! The means of relieving a symptom is magnified into a method of curing a disease, for

instance the "antiseptic treatment of typhoid fever." The morbid anatomy, the real nature of the pathological process, perhaps even its cause, are neglected. Ignorance of pathology presently leads to indifference and carelessness in diagnosis, which are only too apt to become a habit. It stops systematic clinical investigation, particularly physical examination and urinary analysis, and encourages haste and the practice of an entirely irrational routine. Neither does this unfortunate system increase the knowledge of the actions and uses of the drugs which are being constantly employed. Drugs are used in it to control phenomena instead of processes; and—which is equally unfortunate—an extravagant belief is created in medicinal at the expense of non-medicinal remedies. Thus drugs come to be regarded as substances for "treating" certain symptoms irrespective of their nature or significance; and diseases come to be but names or labels, each with its indexed cure.

Routine symptomatic treatment also leads the practitioner to neglect and ignore the conservative factor of disease. He interferes with every prominent symptom, never asking himself whether it signifies evil or good. He checks cough in bronchitis, where recovery may depend on removal of the products by expectoration. For a child that has been fed persistently on milk and amyloids until it is naturally the subject of anorexia, vomiting and diarrhœa, he prescribes some further kind of patent food, bismuth to quiet the refractory stomach, and Dover's powder which drowns the call for purgatives.

Equally unfortunate is the effect of routine interference with clinical phenomena in masking some of the most important of our clinical guides, and disturbing the natural history of the disease by which more radical treatment—indeed the whole management of the disease associated with its progress and prognosis—is being directed. Matter-of-course treatment of fever by means of apyretic drugs has much to answer for in this direction. No sooner has fever manifested itself than it is crushed for a few hours with a dose of acetanilide. This proceeding, continued for some days, completely deprives the temperature curve of its value clinically.

The readiness with which opium deludes the doctor in obstruction of the bowels is proverbial. It improves the appearance of the patient so much that surgical treatment is considered unnecessary; and—even if the practitioner be careful not to be deceived in this respect—it deprives him of his clinical guides to the proper moment for interference. Even beyond this, one might say that anodyne treatment often deceives the very reflex centres themselves: it not only relieves pain but arrests associated acts of spontaneous relief, such as cough and hyperpnœa, which might be of great diagnostic, prognostic and therapeutic service.

The visceral disorders and the disturbances of the natural course of disease which have been produced by indiscriminately prescribing for symptoms as they arise, without regard to pathological indications, readily go from bad to worse; and this in several directions. A second set of drugs are ordered to correct the symptoms produced by the first set and erroneously attributed to the disease. Quinine, alcohol and purgatives follow upon opium. By this time the principles on which treatment was originally planned are lost; and the practitioner is found pursuing an *ignis fatuus* of one symptom after another, each produced by the drug last prescribed!

In the last place, the pursuit of direct symptomatic treatment readily leads us to do too much—a serious mistake in therapeutics. Relief obtained after a wholesale fashion may be purchased dearly: often at the cost of the case itself. Not the least of the many harms of routine drugging to meet every individual phenomenon, whatever its significance, is disturbance of the primary functions of the body—the digestive, assimilative, and excretory especially—on which we are so dependent in the treatment of disease. Opium, given so indiscriminately to relieve pain, insomnia, diarrhœa, cough and discomfort, has most commonly of all drugs these unfortunate effects on the alimentary canal, liver and kidneys.

Practical Applications of Symptomatic Indications.—The practical outcome of this discussion may be represented categorically as follows: Under all circumstances be prepared to relieve pain and other forms of distress, to avert danger, to

support strength, and to remove disorders of the great or primary functions—alimentary, excretory and nervous in particular, on which recovery depends so closely. But in doing so, observe the following rules of practice as closely as urgency permits :—

Subordinate the symptomatic indications to more radical indications.

Interpret the significance, ætiologically and pathologically, of the " symptom " which calls for direct attention.

Relieve distress by the simplest means—by means which disturb the system least whilst answering the purpose for which they are prescribed.

When palliative treatment is employed as a matter of urgency, regard it as a temporary or partial measure, to be superseded or accompanied by more fundamental methods as soon as possible.

When palliative treatment is being employed as a matter of urgency, do not forget that the most important indications remain to be fulfilled—to deal with the disease itself on which the disorder depends, and which may be not only masked but aggravated by the palliative employed.

The individuality or personality of the patient must always be considered. This rule holds good for treatment of every kind, but it particularly applies to symptomatic treatment, and most of all to treatment by anodynes and stimulants. We must pause and weigh the consequences before giving a hypodermic of morphine even for severe colic to certain persons, such as former *habitués*. The responsibility for lapse or relapse into alcoholism will often rest with the practitioner who incautiously prescribes brandy to a delicate nervous woman for some urgent symptom.

CHAPTER V.

PRINCIPLES OF TREATMENT FOUNDED ON THE CLINICAL COURSE OF DISEASE.

SEARCH FOR CLINICAL INDICATIONS—*continued.*

A KNOWLEDGE of the Course which a disease naturally follows is an indispensable guide to its rational treatment. The plan that is arranged for the management of a case when it is undertaken will necessarily be different according as it is running (or is expected to run) an acute or a chronic *course*; and it is manifestly important that the plan should be drawn up as early as possible. The recognised *terminations* of a disease are invariably given their due weight by the practitioner. The prevention and treatment of *complications and sequelæ* always form an important part of the management of many diseases. Finally, *convalescence* is a phase of the natural history of disease which is full of suggestions to the therapeutist, and must be carefully considered in the present place.

THERAPEUTICAL STUDY OF THE COURSE OF DISEASE.

The course of disease, speaking broadly, is either acute or chronic. It depends on the patient as well as on the disease.

ACUTE DISEASE.—Acute disease runs its course speedily; the process is relatively severe; it rapidly depresses all the vital functions from the highest to the lowest; and it soon terminates either in complete or in incomplete recovery or in death, according as the one or the other set of contending forces is the more

powerful and persistent. When the course of an acute disease is watched to a successful issue, it is found to present one or other of two chief characters which are of much therapeutic importance. In the one set of instances the morbid process reaches a stage or point of greatest intensity, and then spontaneously subsides and ceases, whether gradually or by crisis. This is the course familiar to us in the acute specific fevers, including the exanthemata. The body outlasts or outlives the natural duration of the morbid process, which is said to be definite. In the other set of acute diseases the process is of indefinite duration. The body as a whole, in its several organs, and in each individual cell (the most vital of them having to be specially regarded), withstands, endures, and finally overcomes the morbid process, not in the way of simple survival, but by virtue of its natural reserve of energy and the continued action of the other resistant and recuperative provisions which we have studied. The body triumphs in the struggle with an acute morbid process which has no natural limit of duration. This is the course of disease familiar to us in septicæmia and pyæmia, some kinds of acute pleurisy, bronchitis, dysentery, severe injuries, etc.

In both sets of instances the disease is said to have run its course; the morbific influence has either exhausted itself or been overcome by natural means, or both. Existence is maintained, although possibly at the cost of part of an organ, or of the impairment of a function or of the constitution itself.

Indications.—Acuteness and associated severity of a disease, irrespective of its nature and other features, suggest a series of important indications for treatment.

The first indication to be drawn from the course of disease when it is acute is *to enable the vital energy to outlast the morbid process.* A name commonly given to the fulfilment of this indication for dealing with acute diseases is *expectant treatment.* We are supposed to wait (*expectare*) for the disease to run its brief and spontaneously favourable course, and to guide the patient through the perils connected with failure of bodily strength or with departure of the pathological process from its normal course. "Expectant"—waiting for—is not

altogether a happy name to have given to the treatment thus indicated. It is not a passive or negative system as might be understood. The practitioner of expectancy watches as well as waits, and he acts as well as watches. In a case of typhoid fever, it is true, he avoids meddlesome interference, in the firm conviction that the disease naturally tends to terminate at the end of the third or fourth week in spontaneous recovery. But at the same time he employs all the means at his disposal to tide the patient safely and comfortably over the period of illness. Above all he sustains his patient's strength with food, in anticipation of the exhaustion of nutrition, circulation and the nervous system which will have developed by the end of the case. He mitigates distress and disorder when they exceed a certain degree of severity or threaten vital organs. He prevents complications as far as he can, and treats with promptness any that may arise. In every instance he provides his patient with the best possible treatment of what is called a general kind—nursing, attention to the primary functions of life, and management as a whole. It is a fortunate circumstance that the majority of the acute diseases which we are driven to treat by expectancy run a course of definite duration, a course too which as a rule is brief. Such are, for instance, the eruptive fevers and croupous pneumonia. The natural course of these diseases is now so well understood, and the methods of estimating the precise day of illness, probability of complications, and strength of the patient are now so highly perfected, that the expectant method can be turned to full account. There can be no question that the mortality of acute disease has considerably declined since heroic remedies were abandoned for what appears an inactive but is certainly a more rational system of treatment.

The second indication is an extension of the first. Something more has to be done than support the strength of the body as a whole. It is necessary *to promote the action of the different natural provisions for resistance, recovery and relief* in connexion with the organ involved, as well as those of a general kind, such as the mechanisms for insuring rest, for refrigeration, and for increased elimination.

These considerations bring strongly before our minds the

important fact that the expectant treatment of acute disease, if it is to be practised at all, as it will have to be until a specific remedy has been found for each disease, must be as thorough and as earnest as is the employment of more active measures. Expectant treatment is not often used as an excuse for doing nothing; rather it is being continually interrupted and spoiled by meddlesome interference in the shape of symptomatic treatment. The value of expectant treatment in a given case depends in great measure on our study of the disease in as nearly natural a form as the safety and comfort of the patient permit; on the strength of our resolution to leave well alone and interfere as little as possible with the temperature, pulse, and other guides to the stage and severity of the illness. The experienced practitioner knows that it is of greater importance to his patient and himself that he should have as his guide in a case of acute pneumonia a faithful record of the natural course of the pulse, respiration and temperature (provided there be no urgent indication to the contrary) than to secure a daily antipyretic effect by means of phenacetin or other drug, which confuses his reckoning and greatly perplexes his judgment. At the same time, whilst it is contended that expectant treatment should be practised earnestly and fully if practised at all, it would be quite wrong to discourage the attempts which are made so extensively at the present day to discover specific remedies for the different acute diseases. The successful introduction by Dr. Maclagan of the salicyl compounds in acute rheumatism proved how speedily expectant methods of treatment are abandoned when a true remedy can be employed.

The points to which attention has chiefly to be directed in carrying out the details of constitutional or expectant treatment according to the first two indications may now be summarised. First and chiefly, it must be mainly supporting or nutritive in character, by means of a proper amount and kind of food, given at short intervals, fluid, highly digestible or even predigested; and possibly of stimulants. Secondly, rest of body and mind must be diligently secured to the patient. Sleep must be the chief consideration next to feeding. Bodily distress of every kind, such as pain, thirst and the many

discomforts attending fever, must be relieved. Of almost equal importance are the indications to be drawn from the helplessness of the patient suffering from acute disease, the chief of which are to insure personal cleanness, free elimination and removal of the excretions of the skin, kidneys and bowels, and to attend faithfully to the hygiene of the sick-room.

The third indication in acute illness is *to mitigate the severity of the disease;* and if possible *to shorten its duration,* limited although it be. The reasons for these rules of practice (*curare cito*) hardly require to be stated: they are followed mainly in order to diminish and shorten suffering and anxiety, to avert danger, to save the patient's strength, and to lessen the risk of complications and the extent and degree of immediate and remote damage and unfortunate repair. From what we have just seen, two lines of treatment are calculated to fulfil this indication, besides surgical proceedings, to which further reference is unnecessary. These are specific treatment and constitutional treatment. The specific treatment of acute disease is directed against the specific causes (microbes, poisons, etc.) of the pathological processes. On this principle several acute diseases of indefinite duration are successfully controlled. Malarial fever is treated with quinine, acute rheumatism with the salicyl compounds, syphilis with mercury, diphtheria with antitoxin; and all successfully, the severity of the morbid process being distinctly controlled and its duration shortened. We have already discussed specific treatment under the head of the causes of disease, which it directly assails. We are not concerned here with the *modus operandi* of the different specific substances, but simply with the fact that in them we possess the means of fulfilling an urgent indication derived from the acute course of a disease.

Unfortunately, however, the number of specific remedies at our disposal is very small. There remain a number of acute febrile processes of definite duration over the course of which we still can exercise no such control. We are driven in the case of these diseases, of which the eruptive fevers may be taken as illustrative instances, to have recourse to the second line of treatment just recognised as rational—that of

directly assisting by every means in our power the natural provisions which the body possesses for encountering disease.

A fourth indication that follows from the acuteness of a disease is for *immediate action*. What has to be done is to be done quickly, or it may be too late. The correctness of this principle is most obvious when there exist ætiological and pathological indications capable of fulfilment; for instance, in acute intestinal obstruction. The same necessity arises when any symptom of the disease, like hyperpyrexia, rapidly becomes severe, or a serious complication is rapidly developed, such as hæmorrhage.

Lastly, the management of acute disease must be marked by *close and unremitting attention* on the part of the practitioner to every change of symptom. There must be promptness to seize on the condition of the patient, and readiness and resolution in the employment of the necessary measures. There must be faithful, unwavering adherence to the system which is being pursued in spite of increasing danger. The nurse must display the same qualities; yet her loyal execution of orders must be tempered by resource of management. Thus whilst "support" is the watchword of the instructions which are being observed, it may be right on her part to postpone feeding for the sake of precious sleep, and to withhold for a time any part of the details of nursing which might appear to draw upon the patient's scanty strength to a dangerous extent, such as raising or turning him or the administration of an enema—indeed at some critical moments even feeding by the mouth.

Chronic Disease.—The main course that disease pursues when it is not acute is known as chronic. The duration is then practically indefinite.

Chronicity presents many features of interest and advantage to the general therapeutist, and also affords him many valuable opportunities. The destructive and conservative factors of disease can be far more readily traced running side by side here than in acute disease, the different provisions for resistance, recovery and relief being brought into action as circumstances demand and permit. Chronicity affords an

opportunity for spontaneous repair, which essentially requires time if it is to be really perfect, as do also the other pathological methods of recovery, such as hypertrophy and the establishment of collateral circulation. Even when disease is progressive, like pulmonary tuberculosis, its course may be discontinuous, consisting in serial invasions of different parts of healthy structure with periods of quiescence between them which are both suggestive and opportune. Again, patients "grow out" of many diseases in time, particularly at certain critical periods of life, such as puberty, the age of twenty-one, and the climacteric in women. Time also kills many troubles by virtue of the precious dispensation by which man becomes accustomed to pain, disability and other misfortunes that at first produced feelings of impatience, resentment and despair.

Lastly, time partly favours the practitioner in dealing with chronic disease, inasmuch as he can himself proceed with deliberation both in instituting his treatment and in carrying it out. Abundance of time is afforded him for observation, much of which, such as analyses and the determination of temperature curves, demands days or even weeks. Amongst other observations the accurate study can be pursued of the actions of the different remedies employed. Accumulation of exact knowledge in these ways cannot fail to influence treatment for good. In addition to observation, means of treatment also are made available by time. The practitioner possesses himself of instruments and drugs which may be beyond his reach in the urgency of acute disease. He can prepare his patient for treatment. He can seek the assistance if required of written or personal authority. If he fail, he may try again and again. These are enormous advantages, referable to the slow march and little urgency of the patient's condition.

On the other hand, the course of disease presents certain disadvantages consequent on chronicity. Its most obvious effect is exhaustion of the vital powers, with loss of strength and substance, anæmia and nervous debility—a process of waste. Beyond these results it is in chronic disease that we meet with the most marked instances of the establishment of

vicious circles, bad leading to worse, as we have already seen in the section on pathological indications. Still further, protracted disease sometimes leads to degeneration of different kinds—fatty, fibroid, calcareous, amyloid, which are the result of persistence or chronicity of the primary pathological change. As for the patient suffering from chronic disease, he often stands in the way of his own treatment and recovery, by being less amenable to advice, less tractable than the sufferer from acute disease. He becomes disposed to interfere with his medical attendant, whether on the one hand from impatience or unreasonable discontent, or on the other hand by lapsing into valetudinarianism or even hypochondria, and indulging in irregular misguided self-inspection and self-treatment. It is also true that the comparative absence of urgency which characterises chronic disease does not arouse in the practitioner the same amount of interest, enthusiasm and action as are evoked by acute disease. There is less excitement over it; and the chronic patient is liable to be guided with comparative looseness of hold. Any interest and activity displayed in treatment do not tend to increase, but the reverse, as the case drags on from week to month; and it is one of the benefits derived by the patient from change of place and doctor that "fresh blood" is imported into the management of his case.

Indications.—Keeping in view these and other influences which work partly for him and partly against him when he is dealing with chronic disease, and because it is chronic, the practitioner will be guided by such indications as the following in planning the treatment of a disease of long and indefinite duration:—

The first and most obvious indication is *to shorten the course* as much as possible, but always with proper judgment. Art must come to the assistance of Nature whenever methods are slow, protracted and exhausting, in order to save time and strength and spare suffering by accelerating and shortening the course. Many surgical operations are inspired by this principle, such as the opening of chronic abscesses and the removal of sequestra. The unfortunate results of chronicity may thus be removed; more often they are prevented.

Vicious circles, too, may often be anticipated, for instance in compensated valvular disease of the heart; or if already established they may be broken into.

In thus shortening the course of chronic disease the practitioner must, as has been said, act with proper judgment. Before he interferes he will avail himself of the many advantages which chronicity affords him. In particular he will multiply and extend his observations of the disease sufficiently to complete his knowledge of the nature of the case and make his plan of treatment as perfect as possible. Being in a position to avoid precipitancy, he will take time. Patients exhausted and discouraged by protracted suffering and anxiety, for instance in renal calculus, often expect immediate relief when they consult a fresh authority, whereas a whole series of rigid investigations of the urine and physical signs must precede even an opinion, much less active treatment. As a matter of experience, also, it is often unwise to practise the rapid treatment of chronic disease. Cardiac dropsy is not always safely removed in a few hours if it have been slowly accumulating for months. Sudden change from free to strict diet may prove fatal in diabetes. Indeed in some instances there may be an indication *to prolong the period of treatment:* to make haste slowly. The surgeon has to exercise great skill and patience to prevent the premature closing of some wounds. A cataract must have time to ripen. The natural feelings are often very unsafe guides on the subject of length of treatment. Clinical experience plainly indicates the necessity to keep the subjects of endocarditis for weeks in bed after they wish to rise; to forbid solid food in typhoid fever for days after the appetite has returned; and to send abroad the sufferer from pulmonary consumption for one or two winters after he himself feels quite well and fit for work.

In chronic disease characterised by discontinuity or alternate periods of activity and quiescence, such as gastric ulcer or valvular disease with compensation, *periodic recurrence is to be anticipated.* Such recurrences do not happen without cause, which must be foreseen and prevented. Thus recurrence as a feature of chronic disease, instead of being a

source of anxious anticipation, furnishes the practitioner who appreciates it intelligently with a thoroughly rational and indeed successful line of treatment.

In chronic disease *advantage is to be taken of periods of quiescence.* Serial pause in the morbid process affords the practitioner an opportunity which he must seize. As quiescence is in itself evidence not only of the occurrence of recovery, but of the possession of the power of recovery—a point of radical importance, so it indicates the fitting moment for interference, to turn nutritive activity into healthier channels, to increase the failing reserve, to take some critical step in the treatment. It is during periods of quiescence that patients with chronic phthisis are sent abroad, and that recurrent appendicitis is dealt with radically by the surgeon.

On the contrary, the *period of activity may be opportunely employed* to apply treatment which is useless during quiescence. It is only when ill that some persons are amenable to advice. The occurrence of hæmatemesis in the course of chronic alcoholism, for example, furnishes an excellent opportunity for administering an outspoken warning to a free-living man who makes light of counsel as long as he is well.

Chronicity of course also permits us to *take advantage of critical or otherwise important periods of life, times, and seasons.* The experienced practitioner never fails to reckon on this feature of disease. He selects or avoids, respectively, periods of functional activity or rest such as the menses or pregnancy, or particular ages, in planning medicinal treatment, arranging for operations (harelip and cleft palate, for example), and so forth. The programme of the management of a case of pulmonary phthisis, as far as it relates to climate in particular, often turns upon the season of the year when the case presents itself, and on the probability of its being of sufficiently slow or chronic course to enable the patient to hold his own till more favourable weather comes.

Of equal importance with the supporting and actively stimulant treatment of acute disease, is an indication for the management of chronic disease in respect of the primary functions of life, namely, *to maintain their efficiency* as far as possible by natural means, that is by wholesome physiological

exercise. Unless there be some local or other reason to the contrary, the supply of nutritious food at the same time must be ample but not excessive; and adjuvants to food, such as wine, artificial products, oils, iron and other tonics may be given if otherwise indicated, and provided digestion, assimilation and elimination are active and in order. In a large number of instances, physical exercise is indicated in chronic disease, in place of the rest which acute disease demands and compels; and it is an unfortunate circumstance of the commonest of all chronic diseases of importance, tuberculosis, that climate, weather and the involvement of bones and joints so often stand in the way of open-air life. It is in chronic disease, also, that the indication and opportunity present themselves of employing some of the many "courses" of treatment which influence metabolism—medicines, mineral waters, baths, electricity and massage.

For reasons and in ways that have been already suggested, *change of treatment* from time to time is indicated in diseases which are chronic. Variety of occupation and of interests generally may be included under this head. Change of scene, of food,[1] of air, and of medicinal and non-medicinal remedies afford peculiarly grateful and beneficial variety in these circumstances. This must not be taken as a recommendation of vacillating purposeless changes, but the reverse. Whilst it is intended to be change for the sake of change, it is change deliberately planned and methodically carried out. Periods of entire relief from all drugs are sometimes invaluable in chronic disease; and they also permit of the elimination from the system of such powerful agents as mercury, arsenic and strychnine, and enable us to note with care the condition of the body left to its own resources.

The personal qualities and characteristics of the patient have to be specially reckoned with in chronic disease. These belong to temperament as well as constitution. Patience, contentment, cheerfulness and courage are invaluable attributes or elements of the mind of the chronic sufferer if ultimate success is to be attained. The opposite qualities of mind often render treatment abortive, however intelligently it may be

[1] W. Roberts, *Brit. Med. Journ.*, London, 1890, vol. ii. p. 884.

planned and however well directed. In this respect, as in the management of acute disease, women are better patients than men. The experienced practitioner when entertaining the plan of subjecting a man of active mind and habits to prolonged treatment by rest and strict diet, say, for aneurysm, never fails to enquire closely how far the patient's temperament and disposition will bear the strain—whether he be likely to prove tractable, or whether he would not lose more by subjective restlessness than he gained by bodily quiet.

Lastly, when it is known that the course of a disease will prove long, the practitioner himself must be prepared to display a different series of mental resources, natural and cultivated, from those which we have found to be necessary to the successful management of acute disease. He must exhibit untiring perseverance, assiduous attention, and unfailing determination and tenacity of purpose—in the face, it may be, of repeated discouragements. Hopefulness of mind and cheerfulness of manner at the same time must season all the measures employed, and will not fail to communicate themselves to the nurse, the patient and the patient's friends.

Therapeutical Study of the Terminations of Disease.

In every case that comes before him, the practitioner reaches a prognosis or opinion of the probable result, whether he distinctly formulate it or no, and by this in part he shapes his line of treatment.

In certain diseases, acute and chronic, recovery is practically unknown: whether rapidly or slowly, they always end in death. A less unfavourable group of diseases are those in which recovery is at the best but incomplete, inasmuch as the affected part cannot be perfectly restored to the normal. The patient does not die, but he remains permanently damaged, disabled, delicate, and possibly in distress. Such is the termination of a proportion of cases of cerebral hæmorrhage (hemiplegia), and of acute endocarditis (valvular disease of the heart). A part of the brain, a valve of the heart, is permanently damaged: the man is healthy but not sound. Incomplete recovery often means nothing better than quiescence

of a pathological process; tuberculosis, for example. Or the incompleteness of recovery is shown by a disposition to relapse, as in perityphlitis and gastric ulcer; by diminished resistance to the causes of fresh disease (predisposition); as well as by increased slowness and incompleteness of recovery from subsequent illness. In this way amongst others a vicious circle forms and widens. Or, again, incompleteness of recovery takes the form of a permanent dyscrasis of the blood, as in syphilis and perhaps in influenza. As distinguished from these unfavourable modes of termination, the practitioner finds that, after all, complete recovery is not only possible but the most likely event of disease in most instances, even when this is acute, provided time be allowed—a variable time in different diseases and in different subjects. The proportion of favourable to unfavourable results differs widely with different affections; and the proportion of recoveries, and of complete or partial recovery, to deaths is greatly affected by the manner of treatment.

Indications. — Considering the subject here from the general point of view, the first indication to be drawn from the recognised terminations of disease is to strive *to secure complete recovery.* We have to reduce both the mortality and the risk of permanent damage. Mortality from disease is not fixed. On the contrary it is slowly declining; and the mortality from many individual diseases of a grave character, such as ovarian tumour and hepatic abscess, has been greatly reduced in recent years. The number of instances in which permanent damage remains, as well as the degrees of damage, are also much less in these days of perfected surgery.

When better cannot be done, and in particular when life itself is at stake, we must *be content with less than complete recovery.* We must be prepared to sacrifice part or the whole of a limb or of an organ or function in order to avert death. It is on this principle that so many of the grave operations of surgery, such as amputation, are justifiable and indeed urgently indicated. It is on this principle that the one eye is instantly removed after serious injury, in order that the function of the other may be saved and total blindness averted. How these different ends are to be secured is a

matter of detail which could only be considered under the individual diseases.

If permanent damage be inevitable, the indication is to *reduce it in degree and extent* as much as possible. Deformities of limbs as the result of repair are properly and successfully treated by operation. The contracted chest consequent on pleurisy is systematically expanded by calisthenics. The usefulness of a paralysed limb may often be materially increased by electricity.

A permanently damaged organ or function demands constant consideration in the future. This indication from the terminations of disease is one of extreme importance. A damaged part, now healed, has to be protected from fresh invasion by the causes of the original disease or other pathogenetic influences. A disease or disorder that has become quiescent under treatment, like phthisis or epilepsy, must not be allowed to recur. Recovery must be maintained. The influences around the subject of incomplete recovery must be kept permanently under some degree of control, as is familiarly illustrated by compensated disease of the valves of the heart. Functional demands made on the disabled part will have to be reduced to the level of its diminished capacity. The paralytic must be content to spend an uneventful existence, as free from excitement and exertion, and from circulatory and nervous strain in general, as human life can ever be made. The youthful subject of valvular disease is directed to guard the heart against fresh lesion from rheumatism or chorea, and at the same time to keep the load of the circulation well below the driving power of the ventricles by avoiding every circumstance calculated to tax them unduly. This therapeutical principle might be called the establishment of a new physiological balance. In addition to this we must remember that the unaffected parts will have to be preserved with scrupulous care from spread or return of the morbid process, as is illustrated in arrested tuberculosis. General nutrition must also be fully maintained.

This indication also applies to permanent damage of the blood or the constitution, where a "dyscrasia" is the result of disease. Syphilis, malaria, influenza, and probably many other

diseases, appear to permanently alter the system; and with very few exceptions, for the worse. The subjects of these diseases are "never the same after": their health is impaired. This circumstance has always to be considered in the mode of life, in the maintenance of health generally, and in connexion with future illness and with future treatment.

When irreparable loss of an organ or function cannot be permanently averted, it is to be delayed by *arresting the progress* of the disease. The advance of blindness in pigmentary retinitis may be slowed by careful treatment, which is obviously indicated although the ultimate result is inevitable.

When death cannot be averted, the indication is *to make it as remote as possible—to prolong life;* and at the same time *to reduce suffering to a minimum for the remainder of life.* There are many obvious reasons, into which we need not enter, for the observance of this rule of treatment, besides the natural indication, which humanity respects, that the struggle is to be maintained to the last. Even in cases of a hopeless description it is not only legitimate but correct that the practitioner should sustain the vital powers as long as life continues. Medicine is not yet so perfect a science of observation as to enable us to give an absolutely correct prognosis in every case. If the condition of the patient be miserable as well as hopeless, the indication for the relief of pain and other kinds of distress must be faithfully respected, and euthanasia insured.

Under similar circumstances, when the condition is desperate, the indication occasionally presents itself for the employment of a desperate remedy. This is called *indicatio vitalis*—giving a patient the benefit of the *dernier ressort.* The "last chance," for example, is occasionally afforded to a patient dying of acute peritonitis by opening the abdomen.

In absolutely hopeless cases the treatment known as *euthanasia* is indicated. In this the principle involved is the opposite of the one just mentioned. Instead of being subjected to a perilous operation which hastens the end if it do not prove a remedy for the desperate condition, the patient is conducted in as calm and comfortable a manner as possible to easy but certain death. Resignation takes the place of resist-

ance and struggle. Hope and active assistance, which is founded on hope, are finally abandoned. The practitioner accepts death as the inevitable result, and ceasing in his attempts to avert it, directs his whole attention to making it easy. With this end in view he may not only prescribe active sedatives, such as morphine, to prevent pain and promote rest and sleep and mental calm, but he avoids the many details of treatment with food and medicine which are calculated to increase the miseries of the dying and possibly to hasten the end.

Important indications are furnished by the *manner of termination* in acute disease. In certain acute diseases like pneumonia and typhus the active phase naturally ends by crisis—a veritable turning-point in the course of the illness, where the event may hang entirely on the skill with which treatment is planned and carried out. Success depends on an intelligent anticipation of the coming crisis; on the provisions that are made to meet it, and on the way in which these provisions are fulfilled. The treatment of crisis must be mainly stimulant and nutritive—to support the heart and maintain the body-heat, which are suddenly and it may be greatly depressed. This system will include the avoidance of lowering measures for some time before the crisis is expected. There is need here of the highest development and the fullest display of those qualities in the practitioner and in the nurse which we found to be essential in the management of acute disease. Further, inasmuch as danger is by no means ended with crisis, the indications for the management of it often continue, in a modified form, for a few days. In another and larger set of cases the termination of acute disease or of the acute stage of an acute disease such as typhoid fever, whilst perfectly definite, is gradual—by so-called lysis. The indication for stimulation and for support generally is much less urgent under these circumstances than it is in crisis. Still more frequently the favourable termination of a disease is perfectly indeterminate, for example in acute pericarditis or pleurisy. No special precautions are then indicated.

Therapeutical Study of Complications and Sequelæ.

In a small number of instances complications and sequelæ have no pathological relation with the primary illness, a second disease supervening on the primary one and turning the scale against a process of recovery which is being established either by nature or by art. More often complications are fresh manifestations of the original morbid process, like tuberculosis of the larynx or bowels in the course of pulmonary phthisis. Or the primary disease may be the efficient cause of the so-called complication, as bone disease is of amyloid degeneration; or it is the predisposing cause, as rickets leads to broncho-pneumonia. It must be confessed, however, that in many cases pathological relations have less to do with the origin of complications than ignorance, carelessness, want of judgment or other avoidable causes on the part of the practitioner, nurse, patient and patient's friends. Diarrhœa in phthisis may be due to over-feeding, not to intestinal tuberculosis. Endocarditis and permanent valvular disease are too often the result of prematurely permitting a rheumatic patient to indulge his craving for solid food, to see his friends, or to sit up. Bed-sores can usually be traced to inattention. Occasionally, again, it is from a radical error in diagnosis that complications arise. Grave hæmorrhage from the bowel may be the first event to awaken the practitioner to the existence of typhoid fever which he had overlooked. Naturally the chronic course into which a disease drifts when it has been misunderstood and mismanaged is peculiarly liable to develop complications. Indeed, even when employed on sound principles and with every attention to detail, treatment is responsible for some of the complications which arise in the course of treatment, and which are not always correctly interpreted. Disorders of the stomach and bowels in acute disease are largely due to injudicious—mostly excessive—feeding, or to the action of some of our most precious drugs, such as digitalis, quinine and iodide of potassium. The anorexia, constipation, hepatic disturbance, and general indisposition from which many phthisical patients suffer are often but the phenomena of morphinism.

Indications.—This short sketch of the relations of complications and sequelæ will serve to convince us that our primary duty is *to prevent them.* Many complications can be deliberately reckoned with in advance — hæmorrhage for example, in planning the treatment of typhoid fever, endocarditis in acute rheumatism. We shall be best qualified to deal by anticipation with these as with the other incidents of the course of disease, if we put our trust in knowledge of the pathogeny of the primary disease, and faithfully observe and honestly interpret the clinical phenomena as they arise, including the effect of treatment. Other indications are obvious. If complications do arise, *they must be treated on the same principles as any other disease or disorder,* that is, in accordance with indications derived from their causes, pathology and clinical characters; always, however, let it be carefully noted, *with proper appreciation of their relation to the primary disease and proper respect for it.* When this rule is observed the question will arise how far the treatment of a complication will interrupt, replace, or otherwise modify the treatment that is being followed. When a complication can be traced directly to the treatment, there must be no hesitation: a change is imperative. When a complication is urgent, such as hæmorrhage or peritonitis in typhoid fever, the same course is equally clear. In another set of instances, and a large one, the demands of complications are very easily met by some simple alteration of the nursing, feeding, or medicinal treatment. Sometimes indeed no change is called for beyond attention to individual or local indications, inasmuch as the complication is but a fresh manifestation of the original pathological process, as we so often see in connexion with tuberculosis. In such circumstances as these it would appear that little difficulty will be felt in dealing with complications. But this is by no means always the case. The gravity of the complication, the urgent need of food and specific medicines, and the importance of the local indications may occasion a conflict of interests which severely taxes and perhaps altogether baffles the judgment and resources of the practitioner. To take a simple and very common illustration. Are salicylates to be stopped in acute rheumatism if pericarditis supervene?

Some authorities say "Yes; lest the heart fail." Others say "No; it is well that the heart should be depressed within safe limits, and safer to let it be depressed by salicylates than by the rheumatic poison."

The reader will appreciate that the relations between primary diseases and complications and sequelæ are too various to make it possible for us in this place to lay down rules of treatment which would apply to all cases and be at the same time of practical value. One great principle however can always be observed. As has been said, the pathological significance of the complication is to be fully ascertained and appreciated, and the relative importance of the therapeutic indications to be drawn from it and of those which were being followed at the time of its appearance is to be carefully weighed, before fresh action is taken.

Therapeutical Study of Convalescence.

Convalescence is return to health and strength at the termination of the morbid process. The patient becomes once more *valens*, strong or fit: he recovers from the immediate effects of the disease as well as from the disease itself. From first to last convalescence may be, and usually is, a perfectly spontaneous process.

Convalescence is best studied in young and previously healthy subjects after an acute disease like croupous pneumonia. The name has also been loosely applied to restoration to a previous state of impaired health or chronic disease after an acute exacerbation or complication, such as pleurisy in phthisis, or a bout of uræmia in chronic Bright's disease. This application is not correct in the strict sense: the patient has only cleared off actual arrears; he has re-accumulated no physiological reserve. A delicate balance has been restored, but the equilibrium is unstable; and the patient who congratulates himself on his "recovery" is presently landed in fresh trouble. Convalescence in other instances remains incomplete for an indefinite time. After influenza, after the primary and secondary stages of syphilis, and after a number of other acute diseases in a less striking degree, as we have already seen

under the head of "Terminations," the blood and possibly some of the tissues may be permanently changed for the worse.

The rate and duration of convalescence vary. It is slow after influenza; it is rapid after typhus; it is precarious for a short period in acute rheumatism from the liability to complications; it is unsafe in scarlet fever because of the risk of sequelæ. On the whole the process of complete convalescence is far slower than it is generally regarded. Any one who has passed through a severe illness can tell how for months after declaring himself "quite well" he was conscious of a delightful sense of daily increase of bodily strength and mental vigour.

In the course of convalescence much is restored: certainly blood, fat, nervous energy, muscular energy, and body-weight or substance as a whole, all of which had been reduced by waste and by want during illness. A healthy circle is established and widens steadily, return of strength and activity in the different organs aiding reinvigoration of the others, and the assistance being mutual. More difficult to appreciate and to describe is the restoration during convalescence of that reserve of strength, that capacity for full physiological strain, which constitutes or is the basis of Resistance, and by which a man is enabled not simply to be well but to keep well. Unless vital reserve be re-accumulated in convalescence, relapse, recurrence, sequelæ or fresh disease may result; or (short of these) at least local pains and early fatigue of the affected part, and general exhaustion on moderate exertion of the nervous or muscular systems. Permanent impairment of health indeed may sometimes be traced to insufficient respect for the process of recuperation during this period.

Indications.—It is clear from the preceding considerations that convalescence as a phase of disease has to be reckoned with in planning treatment. Indeed the character of convalescence to be expected, as being natural to the particular disease, must often be anticipated from the very first: compare in this relation acute pneumonia, influenza and acute rheumatism. It is also a recognised practical fact that the difficulties of treatment may be actually greater during convalescence than in the active part of illness.

The chief ends to be kept before us in our management

of the period of convalescence are *to assist it as a natural process* by favouring it in every respect, by supplying the conditions of it when they are wanting or deficient, and by lightening them when they are difficult; *to insure sufficient time* to make it complete; and *to respect the individuality* both of the particular disease which is being recovered from and of the patient and his circumstances.

In particular blood and fat have to be restored; and as Weir Mitchell has taught us, they have to be restored together.[1] We have here an indication for abundance of food and air, precisely as in repair. Strict attention however must be paid to the functions of digestion, absorption and elimination, lest indulgence lead to disorder or relapse. The convalescent next begins to enjoy a moderate and gradually increasing amount of occupation. This should be had in bed at first, one step being taken at a time—sitting up in bed, reading in bed, sitting up to feed himself in bed, seeing friends in bed. The first day or two out of bed he should not receive visitors, nor fatigue himself with books or letters: the simple change is exertion and excitement enough. This stage safely passed, and strength increasing steadily, the convalescent will now commence definite wholesome physical exercise in the open air—passive at first, active as soon as possible, but always carefully. We must be prepared for complaints of ready fatigue on slight exertion to begin with and possibly slight pyrexia, even when the body-weight has been regained and the aspect is ruddy if not robust. Convalescents from acute disease find it necessary to lie down and sleep in the early afternoon, that is, to sleep twice in the twenty-four hours just like a child. If these measures are faithfully employed, nervous and muscular energy will return along with the colour and body-weight. A complete change of air and surroundings as a whole, particularly from town to country or the coast, and in cheerful company, is universally recognised as the most successful as well as agreeable means of carrying out this indication. It is particularly desirable that a period of convalescence should be spent *away from home*. It can then be conducted in a systematic way; there is no insidious re-

[1] "Fat and Blood": an Essay, etc. 4th ed. 1885.

sumption of work prematurely; and the patient does not forget that he has been ill and begin to occupy his mind with work just at a time when it has fallen into arrears and he is weak and irritable. Certain medicinal remedies are calculated to aid these natural influences, particularly iron, acids, bitter tonics, and more complex compounds such as cod-liver oil, quinine, strychnine, phosphates and hypophosphites; and an allowance of wholesome ale or sound wine often proves very beneficial.

In these days of haste and social pressure it is necessary for the practitioner to insist on one condition of satisfactory convalescence which is constantly being ignored, with unfortunate results—namely time. At the end of a long, tedious and costly illness the patient counts himself a patient no longer; is moved by many other considerations than those of health; and grudges time spent in relaxation which appears to him to be useless or wasteful idleness. The young practitioner fresh from hospital, where he parted with his patients as "cured" before convalescence had well begun, fails at first to understand the importance of complete recovery, remote as well as immediate. This consideration must be steadily kept before the mind of the doctor and patient, and the proper course firmly insisted on. In many instances work must be resumed gradually, and attention paid to the effect of it upon the health. If the weight and colour should still fall away, if the appetite fail, if a sense of unfitness and heartlessness instead of enjoyment attend the first attempts at work, if fatigue come on prematurely, if headache or sleeplessness make its appearance, work must be temporarily reduced in some way or other, or again given up for a time.

In managing convalescence we must respect the particular organ that is recovering, the disease that is passing off, and the individuality of the patient. Brain cannot be expected to mend like a bit of bone. "Out of sight out of mind': a woman who has nearly perished from gastric ulcer resents a period of convalescence after it which she would cheerfully give after a simple abscess in a visible part of her body. Certain precautions have to be specially observed in convalescence from typhoid fever, measles, and other diseases,

respectively. The aged recover slowly; and in planning convalescence in them we must arrange for longer rest in bed than young subjects require. The circumstances of the patient naturally determine in great measure the place and duration of his convalescence.

Summary: Forms or Methods of Natural Control of the course and terminations of Disease, and of Convalescence; General Principles; Value and Applications.

The principal ways in which the course and terminations of disease have been found to be naturally controlled and the process of convalescence successfully effected may now be summarised, as an introduction to broader therapeutical generalizations. We have found that they are at least four in number: (1) *Natural Cessation of Disease.*—Many diseases are of definite and limited duration, particularly the acute specific fevers which subside spontaneously. The broad indication is to practise expectant treatment, beginning at once and pursuing it steadily. (2) *Natural Arrest of Disease.*—Other acute specific pathological processes and many chronic diseases, even when of indefinite duration and uncertain course, are frequently arrested, temporarily or finally, completely or incompletely, by the resistant, recuperative and palliative provisions possessed by the body. Therefore whilst employing every means in our power of shortening the course of disease, we must sustain the vital energy as a whole throughout the morbid process, and maintain in particular the activity of the different mechanisms for meeting disease so as to make recovery as certain and as complete as possible. (3) *Favourable Influence of Time.*—A protracted course lengthens the distress and disability connected with disease, but at the same time it affords in many instances opportunities for spontaneous recovery. Therefore, whilst we attempt to shorten the course of chronic disease, we should take advantage of favourable phases and events in it, and promote the efficiency of the primary functions of the body. (4) *Natural Convalescence.*—When disease

is ended the body may be restored more or less perfectly by its own natural forces. These ought to be assisted by every possible means, and care taken to afford them abundance of time.

It thus appears that whilst disease often terminates in disablement or death because of its severity when it is acute, and of the exhaustion which it produces when chronic, yet in the majority of instances its course is naturally favourable, and its usual end is complete restoration to health in various ways. In other words, it is only when these natural methods of promoting a favourable termination fail that the result is unfortunate.

Cardinal Conclusion.—We thus reach a conclusion of primary importance derived from a review of the clinical course of disease in the most comprehensive sense of the term: *that disease has a natural tendency to cease or to be arrested spontaneously, whereupon the body, which has been maintained meanwhile by its natural forces, is restored to health. There are many circumstances, however, which interfere with these provisions or entirely prevent them, so that disablement or death instead of recovery is the result.*

These considerations teach us that there are both need for interference with the course of disease in many instances and abundant opportunities of doing so. Spontaneous subsidence may not occur; spontaneous arrest fails, from severity of the pathological process or feebleness of the recuperative provisions; the body becomes exhausted, suffering from the chronicity of the disease instead of profiting by it. The therapeutist, who has made himself acquainted with this part of the natural history of disease and with its significance, finds here fresh opportunities of interfering with profit and success. In every instance he can support the natural processes by which the severity, duration, and evil effects of disease are controlled. He can combat some of the pathological processes directly in such ways as to curtail them; others in such a way as to diminish their severity and shorten their course at the same time—variola, for instance, by vaccination, rheumatism by salicylates. He may permit the occurrence of some diseases, such as measles, at favourable periods of life; or, if not, he at least takes extraordinary pre-

cautions to protect persons at certain ages and under other circumstances of an unfavourable kind. He has an opportunity of anticipating complications and sequelæ, and he works for completeness of recovery and thorough convalescence.

Value and Practical Applications of Indications from the Course of Disease.—If the indications which have been drawn from a study of the course of disease be correct, the value of them is of the highest order. The entire plan of treatment, as it is drawn up at the commencement of a case of disease and pursued with proper modifications during its progress, might be said to turn on the course which it naturally follows and on its natural terminations. The prospective issues in cancer, tuberculosis and acute inflammation of the lungs, respectively, determine practically the action of the therapeutist from the very first. The appreciation of the importance of the indication for so-called expectant treatment in acute diseases (particularly such as are of limited duration) constitutes a turning-point in the history of medicine. Scarcely less valuable are the indications for the prevention and treatment of complications and sequelæ, and for the thorough establishment of convalescence, which an improved knowledge of these parts of the natural history of disease has enabled us to reach.

CHAPTER VI.

PRINCIPLES OF TREATMENT FOUNDED ON THE PERSONAL FACTOR IN DISEASE.

Having completed our search of the natural history of disease in general for principles of treatment, we must not fail to remember that disease as it presents itself in practice occurs in the individual, and that individualism or personality is also a factor to be regarded in respect of the ætiology, pathology, and clinical characters and course of disease. The importance of the personal factor as a guide to treatment is difficult to impress on the student, who acquires much of his knowledge of disease and diseases systematically in books, and from pathological material in the post-mortem room. As clinical clerk, it is true, he elicits the age, social position, occupation, domestic and family relations, etc., of his cases, but even then he can have but little knowledge of the patient's individuality —at any rate at first. The resident officers and nurses understand it better. They discover how patients differ, not only in age, appearance, vigour, bearing, but in disposition, courage, patience, hopefulness, in reaction, in recuperative power, and so on. But even after extended hospital experience, no beginner is prepared for the revelation in this direction which will open to his mind when he becomes a practitioner. The importance of the personal factor in his patients' disposition, in respect of repair and other forms of recovery, in the tolerance of suffering, and in what he will call "response to treatment," grows in his estimation daily. He discovers it in the astonishing recovery of one patient from an appalling injury, in his failure to advance a second patient beyond a certain stage of repair; in

the persistent discharge from a wound, or the breaking out of fresh foci of disease; in the steady downward course of some cases; in the startling rapidity with which one grave symptom follows another and death supervenes in the man whose personal history and present habits will not bear investigation. Thus the practitioner learns for himself by intimate contact with nature that which no amount of reading can impress upon him, what indeed his hospital training has possibly tended to conceal from him—that in planning his treatment he has to reckon with facts of a different order from those commonly included in ætiology, pathology and clinical histories, although they might be partially reckoned with under all of these. A subject of this importance calls for careful examination by us.

The chief elements in the personal factor which require to be discussed in the present connexion are age—particularly childhood, adolescence and old age; sex; and the individualism of the patient. Other personal elements, such as race, nationality, occupation and social position must always be duly regarded by the practitioner in planning treatment, but do not call for special notice here.

Childhood and Adolescence.

In infancy, childhood, and adolescence life is comparatively unstable, and body and mind are both peculiarly plastic. Incessant activity and change characterise these phases of existence: the functions of alimentation, metabolism, growth, development, excretion are all fully exercised: there is a steady strain on nutrition, which becomes precarious on the occurrence of disease. So much is this the case that disorders as well as diseases may become serious or even prove fatal. Acute disease develops quickly, follows a rapid course, and terminates earlier whether favourably or unfavourably. Children, particularly infants, soon "run down." The indication to be drawn from these facts is an urgent one. Treatment must be prompt when we are dealing with children. To be of use it must be employed without delay; even disorders, short of actual structural diseases, must be arrested speedily. Further, nutrition is paramount, par-

ticularly in infants. Depressing measures are inadmissible. Stimulants are often indicated in acute disease; and they are found to act quickly, to agree with children, and to do good. The chief occasion for their employment is at the crisis of acute disease. Under the same circumstances and for the reasons just studied, the practitioner must be prepared for more rapid changes in the condition of the young patient than of the adult; and will have to attend more closely to the phenomena and course of acute disease and visit his cases at shorter intervals. For the same reasons also attention should be unremitting however desperate the condition of a child may appear to be, nourishment and stimulants being continued unhesitatingly to the last.

The changefulness of childhood and youth has also to be remembered by the practitioner in connexion with the different periods of development—of breast- or artificial nursing, of the first and second dentitions, of bodily and mental training, and of puberty. Here there are far more occasions, and opportunities as well, for remembering and respecting critical ages, making allowance for them, arranging treatment by them, and taking advantage of them in planning operations, courses of treatment, hygiene, education and management generally.

The diet of the infant and child is quite special, and calls for close attention from the practitioner as one of the principal means of treatment. The naturally keen appetite of the young becomes capricious in illness, passing into complete anorexia and a craving for cold water only which makes feeding very difficult. Digestion is active and afforded but little rest in health; and with it are connected a large proportion of the complaints of childhood, the intestines particularly becoming deranged. Disorders of the stomach, bowels, liver and organs of elimination are often accountable for wasting, anæmia, languor, restlessness and other nervous affections which are credited to constitutional delicacy. We learn from this fact to be chary of ordering tonics for children. Tonics should always be preceded with laxatives; and very often laxatives only are required, mercury, rhubarb and alkalis being peculiarly valuable in these subjects. Equally important and even more frequently necessary is attention to the bowels in adolescents.

It is in youth that we chiefly meet with that disposition to inertia of the intestines and absorbent system which leads to simple anæmia and its many unfortunate results.

The muscles are essentially active, of increasing strength and constantly exercised in the young, who exhibit in a remarkable degree a disposition to spontaneous exercise in the form of amusements. We have to remember in ordering preventive and remedial treatment that confinement to the house is unnatural to a child; and that childhood is the period of life when permanent benefit to the constitution can be effected by free enjoyment of the wholesome influences of the open air and of the country, whether during lengthened periods or on frequent occasions for a few days at a time. But we must not forget that young persons are tempted to abuse permission for muscular exercise, and in many cases require to be firmly restrained in this respect.

The nervous system during the first years of life is peculiarly sensitive or excitable. Reflex action and reaction in other forms are very ready and extreme. Acute disease may be ushered in with convulsions. Constitutional disturbance as a whole and in its several elements is often severe. Remembering this, the therapeutist is careful not to have recourse to powerful measures to depress the temperature in pyrexia, to quiet the circulation or to arrest delirium—measures which are usually unnecessary and often positively harmful. On the other hand, he possesses in measures that act reflexly through the nervous system, such as fomentations, liniments and the milder forms of counter-irritants, more active remedies than they prove to be for adults. With respect to the higher nervous functions, children are naturally very sensitive, shy and timid. Every precaution must therefore be taken in approaching sick children not to alarm them, but to please, interest and amuse them. The medical attendant must cultivate a reassuring kindly manner. The nursing of children is almost a special gift. As a rule a trained nurse, a stranger to the patient, is better fitted for the task than the mother or other relative, who might fail to exercise the necessary authority and to induce the child to take his medicine or even his food. Nervous and excitable though children be, it is

usually a mistake to control sleeplessness and other forms of nervous disturbance in the night by means of medicinal sedatives. Naturally they sleep long and soundly; but restlessness, fearfulness and the like are far less likely to be due to disease or disorder of the nervous system than to be reflex phenomena of disorder of the alimentary canal, calling for revision of diet and evacuation of the bowels. One cause of trouble and crying during the night in children is sometimes overlooked, namely, cold. Children, especially babies, are very easily chilled; all the more so if nutrition be impaired by disorder of the alimentary canal. They must be kept warm therefore, the lower limbs and belly being well clad with light garments.

Repair and compensation are very active in early life. The vital forces naturally spend themselves to a large extent on growth and development. Operations are well borne; and boys in particular recover from injuries of alarming severity.

In ordering medicinal remedies for the young the subject of proportionate dosage must be kept before the mind; and a similar rule applies to the size of feeds of liquid nourishment and stimulants. There are some important exceptions to the general rule for prescribing drugs $\left(\text{dose} = \frac{\text{age}}{\text{age} + 12}\right)$; and in both directions. Children bear and require relatively larger doses than the adult of iron, arsenic, belladonna and antitoxins; relatively smaller doses of opium and its active principles. Medicines must be made as palatable as possible for the young. Some external applications ought to be avoided in these subjects because of the delicacy of their tissues, for instance blisters.

Convalescence is remarkably rapid in children after complete recovery from acute disease; but on the contrary sequelæ are particularly liable to occur after some of the diseases incidental to this period of life, such as measles, whooping cough and scarlet fever; and recurrence in regular or irregular forms is characteristic of rheumatism before and about the age of puberty. These considerations are full of practical suggestions for prevention and treatment. In the same connexion it ought to be mentioned that chronic affections of the lymphatic

system are common and protracted in young people, and ought to be more often prevented by attention to the primary catarrhs and other local troubles in which they originate.

Lastly, it is in the young—possibly in the child, certainly in the adolescent—that the all-important question of the work of his life has often to be settled on the advice of his medical attendant: as to the profession, trade or other occupation which the boy is to follow. Very often actual disabilities have to be regarded when the doctor is consulted, such as heart disease or tuberculosis. In every instance the bodily conformation in general, the build, the mould in which the body is cast, the quality of the tissues, and the disposition must be estimated faithfully before advice is given.

Old Age.

In old age all the vital activities are relatively feeble, and have to be assisted more or less during chronic as well as acute illness. The general body temperature is low; and not only do old persons require to be kept warm, whether in or out of bed, but those of them who can afford and bear to be moved to a milder climate are benefited by spending the winter in the South. The diet of aged subjects must be ordered with particular care, bearing in mind that although appetite may be surprisingly preserved, the digestion of what is taken is relatively incomplete and characterised by flatulence, the action of the bowels sluggish, and assimilation imperfect. If we are to succeed in nourishing them, it is always wise to respect their long established tastes and habits with regard to food, which should not be given at too short intervals nor in highly concentrated forms, and—whilst digestible—should be as little different as possible from what they have been accustomed to in health, milk for instance often disagreeing with them. An attempt may be cautiously made to control the quantity of food taken and to reduce its nitrogenous richness, so as to relieve the waning capacity of the metabolic organs; but speaking generally, it is wiser to order and regulate the diet by the result, including the occurrence or not of flatulence and the evidences of defective assimilation,

than by theoretical views of the amount and chemical composition or kinds of food demanded by senile organs. Peptonised preparations or digestive adjuvants are peculiarly suitable in the aged; and stimulants in the form of sound old spirits [1] increase relish, quicken the secretions and movements connected with digestion, and ensure more successful absorption of the products. Habitual laxatives are almost a necessity in aged subjects, confined as they are to the house.

The impoverished state of the blood of old persons in respect both of quantity and composition suggests great caution in the employment of depletion. The vessels have become dispossessed of part of their elasticity, thickened and lengthened; the blood pressure is relatively high, and the heart correspondingly enlarged although often irregular in action. All this must be duly allowed for when treating aged patients—in the prevention of dangerous flatulence and constipation, by strict supervision of diet and attention to the bowels; in the judicious permission of wholesome stimulants only at meal times; in the addition to whatever medicines may be ordered of moderate doses of cardio-vascular tonics, such as strychnine, iodide of potassium and it may be a little iron and arsenic. The liability to "weak" pulmonary congestions met with in old subjects is, mainly at least, an affair of the heart also; but the respiratory tissues and function as a whole are impaired, and the comparative feebleness and inefficiency of cough and expectoration are to be particularly regarded.

Metabolism is lowered and necessarily altered in some respects as regards its products in the aged. But little active exercise can be taken; therefore passive exercise, ventilation and the state of the skin must be attended to all the more closely. Specific drugs may be less active, but they are not to be used less cautiously, being also slowly eliminated; and poisoning may readily occur with opium, belladonna and arsenic. The interdependence of the different viscera (whether by internal secretions or otherwise) is less close; so that whilst disease of one disturbs the others less than in adult subjects, vicarious help cannot be reckoned on with the same

[1] Druitt, "Report on The Cheap Wines," London, 1865, pp. 6 and 164.

confidence as in the young. Excretion is less free and more precarious—the urine, for example, being less abundant and the total solid excreta diminished. This lowered activity of metabolism in general and the hazardous state of the excretions (as well as many other circumstances connected with advancing years) suggest great caution in the employment of so-called "alterative" measures. This indication applies particularly to spas—mineral waters and the various methods practised at bathing establishments. Old persons may be seriously and permanently damaged by the routine use of these powerful therapeutic agents, unless they are prescribed after deliberate estimation of the structural and functional state of the individual patient.

Clinical phenomena connected with the nervous system present characteristic features in the aged; and great tact, patience, consideration and kindness are demanded both of practitioner and nurse, who have to please and humour them instead of attempting to control them by enforcing authority. These patients are naturally conservative and probably antiquated in their views on hygiene and the management of the sick and sick-room; often they have become self-opinioned, wilful, obstinate and most trying to nurse on this account or because unaccustomed to illness and new to confinement and restraint. Old people are usually wakeful, especially in the morning; and in the case of men they are difficult to amuse or interest during the day indoors or in bed. One should be slow to interfere with the habits of an old person, even if they do not appear wholesome, provided they have been safely followed hitherto; and this with respect to eating, drinking, indulgence in smoking, the hours of exercise and rest, and either innocent addiction to taking medicine or the systematic avoidance of it.

Speaking generally, *disease* in the aged is often insidiously developed, even when acute, because of diminished reflex excitability; of an adynamic type; easily overlooked, and therefore deceptive as regards the greater necessity for support, stimulation and nursing; and slower in its course. Healing and recovery as a whole are less active and less complete: the tendency is towards degeneration rather than regeneration.

Convalescence is correspondingly slow; and whilst it may be said in some instances never to be accomplished, a longer period must be afforded for it after middle life, more time being spent in bed than is necessary for children or adult patients.

Women.

The special considerations which the practitioner keeps before his mind in ordering treatment for women principally relate to the different phases of female life: puberty, the menstrual and inter-menstrual periods, pregnancy, parturition, the puerperium and lactation, and finally the menopause. Not only has each of these phases its own particular liabilities to disorder and disease, and its own special affections with which we are not concerned here; but without regard to their influence on repair and other methods of recovery, and still more on the actions of medicinal and non-medicinal remedies, disorders and diseases not peculiar to the sex cannot be treated rationally. No medicine is prescribed, no operation arranged, without reference to menstruation. Pregnancy necessitates modification of many ordinary methods and means of treatment. Lactation demands special consideration of diet and drugs, for the sake of the child as well as of the mother.

The peculiar cast of the feminine mind is so powerful an element in illness that respect for it may be the most effectual factor of treatment. It is unnecessary to say more on this subject here than that women, each individual woman as she comes under our care, must be understood and managed if success is to be attained in treatment. Whilst women are fanciful, wayward, unreasonable, insusceptible of convincement as compared with men, they are perfectly amenable to the influence of an intelligent, competent practitioner and an observant, thoughtful, tactful, kind nurse. A larger proportion of nervous disorders, as contrasted with structural diseases, are met with in women than in men; and a different class of remedies is called for, including non-material measures and the removal of local derangements which are a fruitful source of emotional and reflex complaints

in the female sex. Women are naturally more sensitive, excitable or nervous than men; timid and delicate. Yet whilst a big strong-looking man may shrink from the pain of a trifling operation, or faint during physical examination of his chest, a woman even of neurotic type, habitually full of complaints and caprices of treatment, often will face the surgeon with equanimity and come through the most acute and severe ordeals of illness.

Complementary of the prominence of the emotional side of their nature, and conformably with their more delicate physique, is the comparatively inferior muscular development of women and their greater disposition to sedentary habits and occupations. Necessarily the appetite is less hearty, particularly in the mornings; and unless care be taken faintness and epigastric cravings may be felt towards the middle of the day, which in some predisposed and weak individuals prompt recourse to stimulants. The much more vigorous out-door pursuits which women have adopted lately are to be heartily encouraged for this reason and many others. The addition of tennis, cycling, gymnastics, fencing, golf, rowing and mountain-climbing to the means at our disposal for the treatment of chronic disorders and diseases in women as well as in men promises to be of great service both to patient and practitioner.

Women bear the many miseries of an acute illness more quietly and altogether make better patients than men. Whilst they are more critical and fastidious with respect to the appearance, personality and manners of their nurse, and on the whole less tractable than men, they take more naturally to her presence and ministrations. On the other hand, in planning treatment for chronic disease less hesitation may be exercised, less trouble taken and less anxiety felt about recommending a protracted course for women, who submit more naturally to confinement to the house and to bed. The majority of women still spend their time at home, whilst men attend to business. The former therefore chafe less under the restraint of chronic illness, whilst the latter mope indoors and are often greatly benefited by being permitted to go and do a little work.

Individualism.

This is the most difficult of all the personal elements to deal with practically, inasmuch as it has to be accurately estimated to begin with. When the patient comes before us we have to note with attention his appearance and bodily conformation as a whole. We survey a man from head to foot, his build, complexion, expression and manner. Is he possessed of great muscular development, intended by nature for physical work in the fields, and therefore dyspeptic, fretful and impatient of the restraints and confinement of an office; or does his appearance suggest a disposition to intellectual pursuits and sedentary life? We enter into conversation with him, not only to elicit the facts of his history, work and habits, which are all-important to us, but to discover his disposition, the cast of his mind. We take means to ascertain whether he is possessed of courage, self-control, patience and cheerfulness, or the reverse; whether he is docile and tractable, or impatient of control whilst a slave to his own work; whether he believes implicitly in medicine, craves for physic and is ever on the outlook for fresh and recent "cures," or despises all treatment, or by preference treats himself. Any inherited or at least family peculiarity should also be carefully noted, including the mode of reaction to disease and to treatment—whether in general, to particular drugs like opium, quinine and iron, or to different natural influences, including climate, weather, etc.

The immediate domestic surroundings of the patient must always be studied and reckoned with. The disposition of his relatives to be cheerful and confident on the one hand, or despondent on the other hand, may be a sufficient weight to turn the scale in a critical case. In particular, the anxiety of relatives may have an unfavourable effect on many diseases in many obvious ways, and demand the exhibition of great judgment and tact by the practitioner.

When all this information has been compiled, the practitioner still feels as it were but on the surface of the patient. The individual cannot be regarded as a mere combination of qualities and circumstances. The several children

of a family, with no obvious difference in their upbringing and surroundings, may be altogether unlike each other in constitution and disposition. Beyond what is appreciable there are other factors of individualism of equal or even greater importance in relation to disease and treatment. These cannot be accurately estimated; nor, if they could be appraised, could they be easily reckoned with or allowed for therapeutically. In most cases no doubt there remains undiscovered, and unregarded in treatment, the very *ego* of the patient. It is but few persons, even the simplest and most open, who wear their heart upon their sleeve.

In this connexion it is important to observe that it would be a mistake to conclude that a man's personality in health will be always a key to his behaviour in disease and to his reaction to treatment. Striking observations to the contrary are being made constantly. The fine handsome muscular man may not only be easily stricken by morbific influences, but may prove unexpectedly deficient in activity of repair, in endurance of the suffering which disease entails, in completeness of convalescence, and in response to well-planned measures for his recovery. The small, delicate-looking man, on the other hand, often exhibits a reserve of strength and a power of recuperation beyond all expectation. It is fortunate that of all circumstances calculated to reveal a man's true character and constitution to us as practitioners, illness is the most likely. It discovers his qualities, good and bad, material and moral: his pluck and tenacity of life, or on the contrary his rapid collapse in the presence of acute disease. Personal characteristics are revealed, not concealed, by disease.[1] It is easier to read a man when he is under treatment than when he is well, active and independent. Here is an opportunity for the practice of those precious faculties known as acumen, insight and personal influence which have so highly distinguished some of the greatest masters of medicine and surgery and made their patients' minds like glass to them. These are faculties in part innate, in part acquired; which are the more carefully to be cultivated the less liberally they have been bestowed on the practitioner by nature. In great

[1] Paget, Quain's "Dictionary of Medicine," 1894, vol. ii. p. 315.

measure they consist of keenness of observation, by which character can be read in face, voice, gesture, dress, manners and bearing generally, and in the smallest and most insignificant-looking details of a patient's surroundings and circumstances. Help in most instances can be got from the patient's friends and relatives, particularly women—wife, mother, sister or intimate friend. They appeal to us very significantly when they say, "You leave him to me: I understand him"; or "He must be approached very cautiously: if you once upset him he will never listen to you again!"

The patient's character is revealed still further and usually more fully as his case progresses. We note the effect on him, bodily as well as mentally, of improvement, of aggravation or relapse, of suspense, of a favourable pronouncement. The actions of medicines and other means of treatment are studied closely as guides to his personal characteristics as well as to how far the plan which is being pursued may be still followed. Idiosyncrasy towards particular drugs, stimulants and foods are attentively observed—whether they are strikingly beneficial or toxic and unsuitable. Some patients are found to do far better when left entirely alone as regards medicines, and even as regards food for a short time.

It is abundantly evident from this review that besides respecting the many indications which have come before us in our study of the natural history of disease from the point of view of the therapeutist, we must be careful to mould treatment to the individual. This principle applies to the drugs which we may prescribe, and to the food, stimulants and other non-medicinal means which we may order. It applies also to the general management of the case. At the very commencement of this, in giving our opinion followed by our advice, the tone as well as the substance of our statement must be deliberately considered. The sensitive are to be treated with particular kindness; the weak encouraged; the obstinate firmly handled; the careless warned; the disobedient threatened or even thoroughly alarmed. Sometimes our appeal must be made to the intellectual, sometimes to the emotional side of the patient's mind, in setting before him his condition, his

prospects and his duty. According to the individual an important factor in the treatment will be to yield at the right time and in the right direction, or, on the contrary, to decline all compromises; and to employ promises—very valuable means of treatment—with discrimination and tact.

CHAPTER VII.

THE PROPER RELATION OF TREATMENT TO DISEASE.

We have now completed our study of the natural history of disease from the therapeutical point of view—its causation, pathology, clinical phenomena and course, and the personal factor which impresses a different character upon it in each instance. According to the scheme which we laid down for ourselves in the first Chapter, we ought now to be in a position to formulate the fundamental principles of treatment, based on a correct appreciation of the true relations of Therapeutics to Disease. We shall do so under the four heads of the Nature of Disease, the Need of Interference, the Opportunity of Interference, and lastly the Justification of Treatment.

The Nature of Disease.—Our enquiry has revealed to us that disease is a dual process. It involves two opposing tendencies from first to last, that is, in its origin, in its anatomical and chemical pathology, in its clinical manifestations, and in the course which it pursues. As in every struggle, so in the struggle for life and health there are contending forces at work. The one set are pathogenetic—these we call the causes and the destructive factor of disease. The other set are physiological—these we call provisions for Natural Resistance, Recovery and Relief. By these provisions disease is largely prevented; by these, if it be established, it is greatly controlled; and by these (or by a spontaneous limit of its own) it is often brought to a happy termination. In a word, the prevention and remedy of disease are founded on the great

natural law of evolution: that life involves *a struggle or attempt at recovery and survival on the part of each individual by means of his own bodily activities.* This is our first fundamental conclusion. It affords us something more than information: it gives us confidence to proceed. It assures us that the control of disease rests on a scientific basis.

Need of Interference.—The struggle involved in disease is an unequal one. Pathogenetic influences prevail. In a considerable proportion of cases natural provisions prove insufficient or miscarry, one or all, at different stages of the conflict—those for prevention, those for relief, and those for repair; or it may be that the bodily strength is exhausted before or after they come into play. The provisions fail from different causes and in different ways; and the results are, respectively, disease, suffering and death. We must try to account for these shortcomings. Possibly they may be reduced to law. At any rate the causes or circumstances of failure call for examination and study by us if we desire to make our treatment—our interference with the natural processes of disease—thoroughly rational. In an inquiry like the present we cannot afford to ignore Nature's efforts, even if we were so to mistrust and despise them as to interrupt them on every occasion in our daily practice. If we understand the causes of Nature's imperfections, we shall be in a better position to control disease. Let us briefly reconsider, from the general point of view, the weaknesses which we have discovered in Natural Resistance, Relief and Recovery; that is, such shortcomings, excesses, or other forms of miscarriage of these salutary provisions as are of a fundamental kind.

In the first place, spontaneous resistance, recovery and relief are by their very nature limited in their scope. There are absolute limits to the range of action of these provisions —to the range of adjustment to external temperatures, of hypertrophy, of anatomical repair, and the like. But in addition to absolute limitation, there are several respects in which these processes stand at a great relative disadvantage to morbific influences and consequently prove unequal to them.

The organs and mechanisms by which protection and recuperation are effected act physiologically and anatomically, that is, within the body only. They do not reach beyond the body in their effects. Automatic mechanisms of resistance cannot assail morbific influences actively until they are actually within the system. They wait for them passively, as it were, behind entrenchments or prepare the body against assault—a method of warfare recognised as weak. Thus the provisions within the blood, constituted by phagocytosis and serum-composition, for meeting the micro-organisms of acute specific diseases, have no control of the growth and spread of these outside the body. The thermotaxic apparatus meets a high atmospheric temperature by dilatation of the cutaneous vessels, by perspiration, and by increased respiration; possibly, too, by diminished thermogenesis; but it cannot lower the temperature of the air by the smallest fraction of a degree. Similarly with the provisions for spontaneous repair and relief. They effect changes from within. They cannot avail themselves of extrinsic influences. Hæmorrhage, for example, is spontaneously arrested in consequence of failure of the heart, by coagulation around the broken point, and by contraction of the vascular coats; but it is absolutely impossible for the body to secure the most effectual and simple means of all, pressure from without, for such compression as is obtained by extravasation is, after all, intrinsic in source. On the other hand, whilst natural resistance and recovery are thus limited, morbific influences and their effects are practically unlimited. Many of the causes of disease, mechanical, chemical and electrical for example, are often so extreme in degree, so sudden in impact, and so swift in their action, that it is altogether impossible for the body to meet them by methods of a simple automatic kind.

In the next place, we have constantly had occasion to observe that the methods of spontaneous resistance, repair and relief show no respect for the individual man. As they are fundamental in their origin and nature, so these methods are wholesale in their application. They are said therefore to be inexorable, blind, cruel to the individual, who if disabled or delicate in any respect, such as age or constitution, may be

overwhelmed in the stage of reaction to disease or exhausted by the very processes of repair. Many a precious life is lost by spasm, vomiting, diarrhœa or suppuration, which have this significance. And not only this, but the methods of spontaneous repair show no respect for the individual organ or tissue. Here again the law is inexorable, cruelly impartial or misdirected. The result—simple repair—is attained at the cost, it may be, of a precious function which is impaired or lost. Fibroid tissue, a valuable material for repair as well as for the limitation of morbid processes and their products, often interferes gravely with the functions of delicate organs like the cornea, the spinal cord or the mitral valve; or it may lead to stricture of canals the patency of which is vital. "It is important to remember that changes, the necessary consequences of the lesion, may be of such a degree as to be injurious to the organism. . . . It must be admitted that the compensating processes are due to inevitable natural laws which govern and regulate all biological processes."[1] Now, if we attempt to trace the origin and significance of this inflexible provision, we discover, first, that it is a means of restoring the anatomical continuity, integrity and life of the parts at the cost of functional value. A lower tissue is substituted for a higher tissue. Repair in the great majority of instances is but a de-generation although it appears to be a re-generation.[2] After all, repair is but the best that can be done under the circumstances. Higher functions have to be sacrificed in order to secure the lower condition of anatomical soundness. The mitral valve is repaired spontaneously after endocarditis, and the result is—mitral incompetence: the result, let us observe, not of the endocarditis directly but of the process of repair.

Another unfortunate feature of the same order cannot have failed to strike the reader, namely that the methods of natural resistance, repair and relief show but little respect for time. They are often slow, protracted and exhausting. Suppuration and the separation of sequestra may occupy

[1] Nothnagel, *Brit. Med. Journ.*, London, 1894, vol. i. p. 741.

[2] Compare Adami in Allbutt's "System of Medicine," vol. i. pp. 116, 119 (7) and 124 (table).

months of misery in doing what is done in as many minutes by the surgeon. Necessarily these spontaneous processes are also independent of season, period and occasion generally. They contrast unfavourably in this respect also with surgical interference, which selects a favourable opportunity.

In the next place the need of interference with nature's efforts arises from the frequent occurrence of intrinsic failure. —We have found again and again that the very mechanisms themselves may be attacked by disease; and failure is then inevitable. In diphtheria, for instance, death may result from the entrance of foreign material, including the virus of the disease, into the lungs through the disabled larynx. Paralysis of the thermic centres in the central nervous system leads to hopeless hyperpyrexia. In other instances the automatic mechanisms for resistance, recovery and relief become exhausted by prolonged effort and thus practically disabled.

Closely allied to intrinsic failure is the unhappy development of vicious circles. In the chapter on Clinical Indications we drew particular attention to the vicarious actions which the different organs mutually display, and we showed how these relations are turned to good in many ways for resisting and repairing disease, and for relieving suffering. But this interdependence of organs proves to have its unfortunate side also, as is seen in the establishment of vicious circles. Disease is seldom limited to the organ that is primarily attacked by the cause. Since "the health of each part is a necessary condition of the health of all the rest,"[1] it follows that when one organ becomes diseased trouble spreads into the other organs. When the wall of the heart fails, the liver affords it temporary relief—thanks to the interdependence of the two organs—by accommodating mechanically within it the blood that otherwise would have over-burdened the cardiac chambers. But the hepatic functions, and in their turn the stomach and bowels, which are dependent on the portal circulation, presently become deranged; and thereupon the heart is further weakened and it may be finally undone by a set of conditions created by itself and for its own immediate temporary advantage. The heart has paid dear for the accommodation. The day of reckoning

[1] Paget, Quain's "Dictionary of Medicine," 1894, vol. ii. p. 315.

has come. Bad has led to worse. A vicious circle is established: the penalty attending the accommodating process and the vicarious action by which one organ relieves another organ in distress. This result appears at first sight to be at variance with the self-adjusting, self-righting properties of the body. Instead of spontaneously recovering, one diseased organ is found upsetting other organs to its own further detriment, if for its own temporary relief. It would appear that this must be accepted as a primary or essential physiological necessity in connexion with all complex organisations and structures. In physiology, just as in finance, mutual accommodation is invaluable and indeed indispensable, and it is often permanently as well as temporarily successful inasmuch as it affords time and opportunity for recovery of position. But the relation on which the employment of it depends, namely, the mutual dependence of associated interests, is liable to land us in widespread and hopeless ruin. In a word, vicious circles are one of the penalties that have to be paid for the many advantages of organisation.[1] The number and area of the vicious circles set up by disease are practically unlimited. The instances just given are striking examples, but a similar order of widening and deepening disturbances may be traced into all the great systems in disease of any moment: arrest of digestion, alimentation and elimination; disorder of sleep; interference with exercise and its attendant benefits, and so on.

Another feature of spontaneous recovery which suggests to the most casual observer the necessity of interference is its intimate association in many instances with pain. Some of the methods of Natural Resistance, Relief, and Recovery involve suffering, that is, they are evoked by pain and other kinds of distress. The effect of suffering may be to arouse attention to danger and to originate or compel acts that are favourable to escape or relief. We have also seen that pain occupies an important place amongst the conditions that favour spontaneous repair and recovery. All this is true; but, however valuable its promptings, distress is in itself essentially evil or destructive. Humanity resents

[1] Cf. Allchin, Quain's "Dictionary of Medicine," 1894, vol. i. p. 485.

this dispensation: it is impatient of distress and urgently demands the removal of it.

Lastly, our study of the natural history of disease has proved to us that recovery is seldom, if ever, perfect. New tissue is less resistant than the original. Collateral circulation is a more precarious condition than the normal. Compensatory hypertrophy of organs is comparatively unstable. And many other facts bearing on this point will occur to the reader.

Clearly it is not enough for us in framing general principles of treatment to recognise the existence of Natural Resistance, Relief and Recovery working in our favour, and to leave the result to Nature. It is true that Nature will always make an attempt. Occasionally she will succeed. But very often she will fall short, or be feeble or slow. Sometimes, indeed, her methods, adapted for general application, will prove excessive, damaging or even disastrous to the individual. Therefore, whilst the practitioner of medicine must make frank and free acknowledgment to Nature, and must study and understand her methods, he must at the same time realise the limited character of her activity, and not only this but the weaknesses and drawbacks—in a word, the failures—of some of her provisions. Clearly Nature is not enough. Whilst the conservative factor of disease is to be recognised and reckoned with, whilst it is not so feeble that it can be ignored, it is not perfect nor to be entirely relied upon. It is the *end* which Nature seeks to attain, the effect which she attempts to secure, that we must respect and promote: not necessarily Nature's *method*, which is often imperfect and too often ends in failure. Thus we have reached a second fundamental conclusion: *that Nature requires guidance and control as well as direct assistance.*[1]

Opportunity of Therapeutics.—In such interference consists preventive and remedial medicine, speaking broadly, for many other considerations of a lesser kind have also to be weighed, as we have seen. When medicine comes to the assistance of resistance it is called preventive medicine,

[1] Cf. Metchnikoff, *op. cit.* p. 194.

prophylactic treatment, or hygiene. When it promotes recovery and affords relief it constitutes remedial or curative treatment and palliative treatment, or simply therapeutics.

In other words, preventive, remedial, and palliative treatment consists in throwing ourselves into the struggle for life and health on the side of spontaneous resistance, recovery and relief. This constitutes the broadest possible statement of the aim, object or *rôle* of the practitioner of rational medicine; and of the position which he ought to occupy in relation to disease.

THE JUSTIFICATION OF TREATMENT.—The proper relation of Treatment to Disease cannot, however, be regarded as satisfactorily settled without some reference to a theoretical objection on principle which has been raised to treatment: that it is contrary to nature's great law of evolution. The Justification of Treatment introduces us, first, to the Significance of Disease, that is, the place which disease occupies in the great scheme of life.

All the previous considerations with respect to pathogenetic influences, resistance, failure of resistance, and the occurrence, course and ending of disease relate to Man as an Individual. The effect of disease on Collective Man—that is, on the Race—is altogether different. Whilst disease ends in the disablement and death of the Individual, it promotes the survival and progress of Collective Man, who is rising to a higher and higher position in relation to other animals and to the rest of nature, and in respect of his own comfort and happiness. Disease is a process of *selection* by which nature maintains and improves the Race. Those individuals who are insufficiently protected and repaired, in whom natural resistance, relief and recovery fail, become diseased, suffer and die. The unhealthy are thus eliminated, leaving those behind who possess resistance and recuperative power more fully, to represent and to continue the Race, and to transmit to posterity those structures and qualities which are best adjusted to the circumstances of life. Perfection is thus being constantly sought, selection being in effect a means of elaborating the provisions of adjustment to the endless variety and incessant changes of the conditions or circumstances of life—

climatic, seasonal, cyclic, social and otherwise—so that health may be constant whilst life varies. Natural selection thus insures more than continuance of the Race: it also insures its progress. This appears to be a part of the great scheme of life: that Nature's first concern is with the life of the Race, not with that of the Individual, who exists not for himself but for the Race, to preserve and continue it and to benefit it generally, at whatever cost of health and life to himself, until his work is accomplished and his time ended:

> So careful of the type she seems,
> So careless of the single life.

Disease and death in the Individual constitute the method and means of Natural Selection, and are essential to life and inseparable from it, as far as it is known by us. "From famine and death," says Darwin, in the closing words of *The Origin of Species*, "the . . . production of the higher animals directly follows."

Now Medicine is charged with being essentially an attempt to defeat this great natural law, because its object is to preserve the delicate, disabled and infirm individuals whom selection is weeding out and would sweep away so as to purge the Race of the unfit. This is a serious indictment. It questions the very morality of remedial as distinguished from simple palliative treatment. Happily it is not difficult to answer. Medicine can be justified by an appeal to Nature as well as to sympathy.

The opposition of treatment to Nature is in appearance only. Those who urge it fail to consider that, even when unfitness exists, *natural attempts at survival are made.* Whatever the result may be—whether health and life, or disease and death—there is always a struggle, that is, an effort or display of the great natural provisions of resistance, relief and recovery. Disease does not originate until there has been a struggle of the natural provisions for resistance with pathogenetic influences. Disease does not continue without an elaborate and persistent struggle on the part of the natural provisions for repair and other kinds of recovery; and at the same time a struggle for relief from pain and other forms

of distress. And lastly, when the force of disease is spent, the body does not *remain* in the condition in which it is left, without a struggle for convalescence. It appears to be another part of the great scheme of life, equally with natural selection, that Nature concerns herself with the Individual as well as with the Race, and permits and enables the Individual to employ provisions with which he is furnished, to struggle for his own life and health against the causes, the presence, and the effects of disease. If the study of life introduces us to disease and death in the form of natural selection, it happily introduces us also to prevention and remedy in the form of natural resistance and recovery.

Our complete duty therefore is to copy and favour Nature in both respects. It is just as natural to lighten the struggle as it is to promote the selection. First, from the side of the Race and in the interests of the Race it is correct to preserve and advance it: to assist Nature in selecting the fittest individuals and thus to promote and advance evolution. Second, from the side of the individual and in the interests of the Individual the chief end to be favoured is to save him, and spare him the many penalties and sacrifices attending natural selection as a means of evolution, and to fit him to stand the test of selection. Now "fitness" means fitness for the circumstances in which life is being maintained, for the environment: not absolute fitness, which is an unintelligible quality. If it be said that a consumptive is unfit to survive, and therefore is not a proper object of treatment, the statement to be complete and accurate should run—in the ordinary English climate, or in a changeable climate. A consumptive is not unfit to survive in a fresh open country with an equable temperature. He lives in such a place with comfort; very probably is the most valuable life of the whole community; and ought to be preserved.

Thus the aim or end of Medicine might be said to consist in taking under our care the interests of the individual patient that he may not be left to suffer from the miserable application of general laws: to promote the life and happiness of the individual (without breaking an elementary law of Nature by retaining the unfit) by so altering the circum-

stances around him, or so altering him, that they and he may be mutually adapted to each other (preventive treatment); and if disease or disability have arisen, by placing and keeping him in circumstances so modified or so selected that he may regain fitness, and recover or at least survive in them, free from discomfort and from the risk of further disease (remedial treatment). In a word, artificial selection is substituted for natural selection. Both the Race and the Individual may then be preserved. Man controls Nature in this direction as in so many others; turns to his advantage her great laws; and claims that his hygienic and therapeutical methods are scientific.

CHAPTER VIII.

MEANS OF TREATMENT.

It is beyond the scope of the present work to do more than refer to the many different means which are employed to fulfil the indications for treatment reached in the preceding chapters. Only a brief survey will be made of the different groups of remedial measures, which the reader will be able to find fully discussed in other treatises.

Drugs fall under the head of Materia Medica, Pharmacology and Therapeutics.[1] Surgical measures are studied practically, in connexion with lectures and text-books on the Theory and Art of Surgery. Electricity, Baths and Massage are the subjects of special treatises, but cannot be learned usefully without close practical study and training in the use of apparatus and manipulations. General care and management in acute disease includes feeding of the sick, ventilation of the room, and attention to the skin, urine, bowels, and the wants, comfort and happiness generally of the patient; it is practically synonymous with Nursing. The student will turn to works on nursing and diet for information on the theory of this essential department of treatment; but he must also learn the subject practically. He must not regard it as the nurse's province to plan these or any measures of a remedial kind. Her duty is to carry out the practitioner's orders in this as in every other part of her task. The medical attendant ought to be able to control, criticise and

[1] See "Materia Medica and Therapeutics: an Introduction to the Rational Treatment of Disease," by the Author.

correct when necessary all that the nurse does, down to the smallest detail. Beyond general management in acute disease, the same great group of therapeutical measures are employed in chronic disease and in the many slight ailments or disorders which constitute so large a part of ordinary medical practice. Thus, amongst the principal means of treatment in such a case we always have to consider Exercise, Rest, and particularly the balance of these two powerful influences on health—occupation, relaxation, habits of work; and the Nervous Influences which surround the patient. Every prescription that is given under these circumstances is kept subordinate to directions for living in accordance with the elementary laws of physiology. Attention to these is in many instances the only help that nature requires.

Of the different means of treatment which have been mentioned, only four groups appear to call for examination in the present work, namely food, exercise, rest and the purely nervous influences. The reader will understand that in discussing the actions and uses of these powerful remedies we propose to deal with principles only. The details of their therapeutical applications will be illustrated in Section II.

FOOD.

Food occupies a peculiar place amongst the means of treatment in this respect that it is the only one of them that is always employed. There are many instances of illness in which drugs, rest, exercise, surgical measures and other classes of remedies are neither indicated nor ordered: food is indicated and given in every instance. Yet it would appear that this consideration is frequently overlooked by the young practitioner. In spite of it and of the fact that he has studied the composition and actions of food in connexion with the subject of physiology even more fully than he has learned those of drugs in connexion with pharmacology, he fails to appreciate the powerful instrument for good or for evil which he possesses in diet, and which he employs, or is supposed to employ, in the treatment of every patient. Excepting in acute disease and

in disorders and diseases of the alimentary canal, he often orders diet in response to the casual suggestions of patients and their friends, or as a matter of routine; or more often he simply ignores it. No doubt in some instances the beginner in private practice is driven to take up this position by the consciousness that his patients know more about the details of the subject than he does himself, and because he finds that it is easier to be complacent than to enter on a discussion where his ignorance might be exposed. It is therefore a matter of great importance that the therapeutist should, to begin with, appreciate the following two points in relation to the employment of food as a means of treatment. The first of these points is that food has a variety of actions on the body in health and disease besides that of simple nutrition. Food is not a mere matter of feeding or giving nourishment. Food is to be employed as a means of treatment at once powerful and delicate, calculated not only to nourish the tissues but to produce immediate, specific and remote effects of a perfectly definite and natural character on the different organs of the body just like the different medicines. Beginning with its admission into the mouth, and ending with the elimination of its products by the different organs of excretion, food possesses a remarkable number and variety of physiological actions in respect of its kind, form and amount, and the frequency with which it is given. So potent a means of treatment ought to be intelligently handled in obedience to clearly defined indications, such as we have discovered in the preceding chapters. The second point is that if the practitioner do not order the diet, some one else will—his patients or their friends. When he permits them to do so, that is to take an important part of the treatment out of his hands, he usually finds that patients yield to tastes and habits that may be morbid, or to advice which is well-meant but probably unwise; and that patients' friends are moved by one thought only—to "support the strength" whatever else may be the result, ignorant or unmindful as they are of the other actions of food. Therefore the practitioner must never lose control of the diet. It is not enough that he should permit different foods: he must employ them definitely as carefully-ordered means of treatment. And when

he is deliberately planning treatment and reviewing his remedies in each case, he should always think of food before he thinks of medicine, and give it a corresponding position of importance in his directions to the nurse or patient.

Kinds, Forms, Amount and Frequency.

Of the *kinds* and *forms* of food employed in the treatment of disease no systematic description is called for in this place. These subjects are fully discussed in works on Dietetics; and they will only be alluded to incidentally in the following pages. On the other hand, the actions and uses of food cannot be profitably noticed for our present purpose without a brief preliminary reference to the influence of the amount and frequency of administration.

Amount.—Whatever the kind and form of food indicated, the amount of it must be definitely arranged as a point of equal importance. Quantity is estimated and ordered by the fluid ounce and pint for fluids, by the ounce for solids in hospital practice, but less rigidly in private practice; by the number of eggs; by the tea-spoonful or table-spoonful of jellies and other concentrated materials, and so on.

Naturally the allowance varies widely with the age, sex, habits and circumstances of the patient, and of course with the nature of his disease. Quite independently of this, however, quantity is an element of food or feeding which possesses of itself quite definite actions, and can be turned to useful therapeutic ends. A large amount of food has the effect of overfeeding the patient; and is employed mainly in wasting diseases, especially tuberculosis, in the repair of wounds in strong healthy subjects, and during convalescence. Overfeeding is carried out by making the diet attractive in form and kind, with an allowance of beer or wine or other agreeable beverage; by insuring pleasing, cheerful surroundings at meal times; or in the case of severe illness by presenting it partly in fluid, partly in highly concentrated form. On the contrary, a small amount of food constitutes what we call "spare diet," which relieves the alimentary canal, the assimilative organs, the metabolic functions and the excretory organs, of much

work, and especially allows complete disposal of the excrementitious products of previous excess. Spare diet is therefore employed in diseases of the stomach and bowels, portal congestion, hepatic disorder, high tension, gout, rheumatism, and renal disorders and diseases. There may be considerable difficulty in ordering low diet, and still more difficulty in enforcing it, at least in private practice. Sometimes we have to be content with such general directions as "Don't eat much of anything," or we are more specific and say "Omit every second dish," and "Never take two helpings." Another plan is to direct the patient to fast on a particular day of the week, that is, to fast as regards all but the simplest foods. Or a deliberate attempt is made to spoil the patient's appetite for his regular meals by ordering a glass of milk or tea,[1] say, an hour before luncheon or dinner, or plain unattractive fare. When it is a question of smallness of bulk only, food is given of a highly nutritious kind.

In a small number of instances the invaluable action of complete fasting is indicated. In all cases of grave abdominal disease, such as acute intestinal obstruction, peritonitis (local or general), perforations, etc., this means is temporarily employed, in order to secure as complete rest of the viscera as can be obtained without drugs, and also in order to prevent the evil effects of the presence of undigested food and its chemical and flatulent products within the alimentary canal. Feeding is often carried to a dangerous as well as foolish extent under these circumstances. The patient's condition is critical, life or death is to be decided within a few hours, and food is positively harmful. Probably many lives are lost in the stage of reaction of Asiatic cholera by erroneous endeavours to "keep up the patient's strength."[2]

Different from these extremes is the action of what may be called moderate feeding, for instance, of the three pints of good fluid nourishment which are now generally recognised as the proper allowance in acute specific fevers. The dangers of unnecessary and excessive feeding have just been referred to; but short of these extremes, it must be remembered that

[1] W. Roberts, *Brit. Med. Journ.*, London, 1890, vol. ii. p. 885.

[2] Macnamara, Quain's "Dictionary of Medicine," vol. i. p. 329.

there are limits to the usefulness of what many might regard as a moderate allowance of nourishment, and that whatever is not required by the system is calculated to create disorder. These limits must therefore be respected. There is great difficulty in this matter with patients' friends, especially women. The present disposition is to overfeed all patients. Even the profession must plead guilty to this: the reaction induced in the treatment of fevers by Graves's famous motto has been extreme. Feeding is also the ready method of treatment adopted by anxious relatives in every instance where one "is looking poorly." But the very excess of nourishment thrown into the system tends to interfere with the activity of nutrition, much as heaping on coal chokes or drowns a fire. A great many persons are short of elimination, not of alimentation, when they are looking poorly. It is a fortunate circumstance that many so-called "strengthening things" are really of low nutritive value and that others of them are very imperfectly assimilated.

When a patient's condition becomes critical from refusal of food or insuperable antipathy to it, resort must be had to forced feeding.

Frequency.—Inseparably associated with the amount of food is the frequency of its administration. To insure the effect desired, food is ordered to be given or taken at certain intervals. In acute disease patients are fed every two hours, one hour, or half-hour, day and night, according to the urgency of the indications. As recovery advances, the frequency of feeding is steadily reduced, until the ordinary number of meals is reached. It is the duty of the nurse to observe the hours of feeding with punctuality; but she may be allowed a certain amount of freedom of judgment in this direction, if sleep be more important or other circumstances contraindicate nourishment. Indeed there are cases in which the paradoxical course must be observed of withholding nourishment because the patient is so low. Even a nutrient enema, a most promising method of giving support in such conditions, may do harm at the crisis of a disease or in the profound anæmia of gastric hæmorrhage, the movement, distress and reflex effect which attend its administration quenching the last spark of

life. Again, if a patient be moribund from acute disease, or his condition utterly hopeless, as in advanced carcinoma, it is unnecessary and cruel to observe strictness of feeding in respect of frequency, amount, fixed hours, and character of nourishment.

Even in chronic disease the frequency of feeding is not immaterial. Thus gravel indicates a somewhat larger number of small meals with a view to prevent extreme height and depth of the acid and alkaline waves; dilatation of the stomach, on the contrary, demands longer intervals than ordinary between meals, in order to complete the evacuation of the stomach.

Special times or hours of feeding have to be arranged in some diseases. In phthisis the first meal of the day is given very early in the morning, so that cough may be assisted or lightened, expectoration promoted, the exhaustion of a bad night counteracted, and the patient enabled to rise betimes and leave his bedroom for a fresher atmosphere. Asthmatical and certain other patients may have to eat their principal meal in the middle of the day in order to prevent dyspeptic and reflex troubles in the night; and so on.

Actions and Uses of Food.

Immediate Local Actions and Uses.

The physiological actions of food may and often do begin before it reaches *the mouth*. Its value as a means of rousing the digestive organs and thus indirectly of nourishing as well as stimulating the body is greatly dependent on the impression it makes on the senses of smell and sight; and indeed on the impression which is made on the patient's mind by the circumstances connected with planning and preparing his diet and placing it before him. It is not only to insure its being taken that food is made attractive, pleasing or at least tolerable. Another effect of the first importance originates in agreeable stimulation of the palate, eye and mind by a well-arranged meal. All the digestive functions are aroused — salivation very quickly to begin with, and thereupon insalivation, deglutition, gastric activity and the rest. The therapeutist must not forget that the palate, in particular,

is more than a janitor and guard. It gives a signal through the nervous system to the active organs of digestion; and if it have been affected agreeably, evokes circulatory excitement, secretions and muscular movements throughout the alimentary canal. This is a necessary physiological arrangement in the healthy body: how important must it be to make a pleasing impression on the palate in acute disease where nutrition is vital! All the parts of the digestive function are depressed in acute disease, particularly febrile affections, and there are serious difficulties in sustaining or restoring them. The first difficulty is the anorexia which attends most illnesses, at least for a time. Thirst is the only prominent form of demand for ingesta. What is more serious, stupor, indifference and apathy supervene in the worst phases of acute disease, feeding is violently resisted in delirium, and the patient would perish of exhaustion if left to himself. That acute disease also arrests or perverts the digestive activities is proved by the state of the tongue and mouth, by the hopeless way in which a bolus is rolled about in the mouth and "will not go down," and by the discomfort, sickness or diarrhœa which it may set up if it be swallowed. The nausea, loathing and positive misery which attend feeding in some patients ought to be prevented. It is an unfortunate circumstance that invalid diet is usually plain. Patients describe dietetic treatment as consisting in cutting off everything that is worth eating. It is also commonly monotonous. Milk and beef-tea are given continuously and with painful frequency and regularity for weeks on end; and even the appetite of a convalescent flags at the sight of his daily mutton chop and custard pudding. In many chronic affections, particularly nervous disorders of digestion, sufficient study is not made of dishes, *menu*, table and company as distinguished from the simple food. It is not surprising that loss of weight and strength as well as depression of spirits is our usual experience under these circumstances.

Clearly, in order to be of use in disease, food should be of a kind or form and presented in such a way as to please the patient. This end can be secured in several ways:

In the first place, we may do so by ordering attractive and attractively cooked food, or food which if not positively attractive shall be as little unattractive as possible. Invalid cookery as an art ought to be more studied by the practitioner. In acute disease food is presented in fluid form which invites the thirsty patient. But this is not enough; and more should be done to cultivate relish. Even milk, the most simple and monotonous of all nutritious foods, can be presented in a great variety of forms with very little trouble—natural, boiled, peptonised, iced, curdled, mixed with a little tea or coffee, strained off bread, etc. Tea made with water or with milk might be given more often than is the custom. Broths are of quite different taste, but of practically equal value, according to the kind of meat from which they are made. We discover here the importance of variety in invalid dietetics. A delicate child who refuses meat will take freely of almost equally nutritious bread-and-butter; and the addition of a little preserve will entice it to eat still more. An alcoholic whose hope of temporary reform and recovery lies in his being able to substitute food for drink may loathe fish and chicken but enjoy tripe judiciously recommended to him. In his attempts at scientific feeding, the practitioner too often forgets to ask the patient what he would like to have.

Of course it is possible to carry the attractiveness of invalid food too far. Obviously it must not be so rich as to be indigestible or to tempt the chronic patient to excess. Neither must diet be ordered in such a way or in such form as to be "attractive" to the patient in another sense—in the sense of making him think of every dish he tastes and every mouthful he consumes, and question whether it suits him. This caution is particularly necessary in certain cases of dyspepsia, in gout and in gravel. When the directions for diet in these diseases are being given, and still more when their results are being watched and tested, it is of the first importance that the whole arrangement should be made as simple, easy, natural, undemonstrative, as much a matter-of-course, as possible. Otherwise the patient's attention is daily or even hourly attracted to his condition and to the activity and success of

his digestive functions; and he watches in particular whether and how far each diet and dish agrees with him. We must therefore respect it as an important complement of the rules appertaining to the selection of food, that the patient be discouraged and distracted from self-observation of this kind. We need scarcely add that there are many instances in which it is not only unnecessary but unwise to entice the patient to eat or drink. The "sinking" of the dyspeptic, the fits of "lowness" of the gouty, the "faint feelings" of the alcoholic, and the cravings of the subject of acute rheumatism and the typhoid convalescent must all be firmly resisted.

In the second place, judgment should be exercised in suggesting, proposing, and offering, presenting or administering food. It is often unwise to plan the diet in the patient's presence; and it is still more unwise, as well as unnecessary, to keep the whole stock of the day's food in the sick-room as is so often done. There are great differences between nurses and between friends in the art of persuading patients to be fed: in coaxing food down in the child, in the irritable, in the aged, in the semi-demented, in the insane, by a variety of artifices and the exercise of patience, by affecting indifference, or even by recommending the reverse. Another way of overcoming a patient's objection to food is to make the quantity offered him small. Each of the feeds is not unwillingly taken; and given every hour they reach the necessary amount. But patients do complain of the worrying effect of frequent feeding: they tell us that they get no rest. Great judgment and tact are demanded of the nurse in such circumstances.

Lastly, in chronic disorders and diseases, when nutrition is an important indication, appetite can be created artificially by means of well-planned aromatic bitters given immediately before meals, and relish promoted by an allowance of wine or beer of suitable kind and amount. This is one of the chief uses of these beverages, and deserves the careful study of the young practitioner. Of equal importance is it that he should learn the value of attention to the *menu*, the table, the room, the service, the company and all the circumstances connected with the meals of some of his patients.

When food reaches *the stomach* it excites the digestive and absorptive activities of that organ. Gastric digestion is a complex process. Nerves, vessels, muscles, and glands are all called into action and continue at work for several hours; the elastic walls are subjected to a considerable strain by the mechanical presence of food and its gaseous products; and the effect of an ordinary meal is only completed on the evacuation of the stomach with a view to rest. The success of this bout of functional activity depends on (*inter alia*) the amount, kind, form and frequency of the food. If food be unsuitable in any of these or in other respects, catarrh occurs, wrong decompositions of the ingesta are set up, retention instead of evacuation occurs, and the many familiar phenomena of indigestion are developed. Now suitability is a relative term. It depends on stomach, on food or on both. It is essential to remember this in health; in feeding the sick it has to be kept before the mind constantly. In the first place the organs of digestion are depressed or otherwise disturbed by disease with few exceptions. Nausea, flatulence, hiccup, diarrhœa, large pale stools, bilious aspect, and thick urine all proclaim weak digestion. Many diseases of the heart, lungs, and liver are necessarily attended with portal congestion and dyspepsia. Disorders and diseases of the digestive and absorbent system themselves constitute a considerable proportion of the cases met with in practice.

In the second place, independently of disability of the organs of digestion, the kind of food indicated by the nutritive demands during illness may be difficult to digest. Milk is by no means so easily digested as some believe. Broths and other slops may prove so flatulent that they have to be discontinued. Stimulants often disagree. Idiosyncrasies as to eggs and milk unfortunately are met with occasionally, and when they occur together they reduce the practitioner to a condition approaching positive helplessness in his attempts at feeding. As we have already seen, the quantity of nourishment given in disease is apt to cause indigestion, however digestible it may be in kind. Flatulence, vomiting, diarrhœa, undigested matters in the fæces, broken sleep and palpitation, as they are met with in acute disease, are common effects of

overfeeding; and tympanites, hæmorrhage and even perforation may be the result in typhoid fever. Anxious relatives are slow to be convinced of this truth; and practitioners are not infrequently blind to it. When will people learn that an amount of highly nutritious food which would upset the healthy cannot possibly benefit the sick?

All these considerations are to be kept in view when food is employed as a means of treatment. In every case that comes under our care, whatever may be its nature, food must not only be given: we must see that it is digested, as a necessary preliminary to assimilation, and that indigestion and its many disturbing or even dangerous effects on the other organs, particularly the heart, are prevented; and if the appetite of the invalid fall away (for instance in phthisis), a purgative and several days' spare diet are to be ordered instead of the abundant liquid nourishment which is usually thrust upon him.

Digestibility of invalid food can be secured in several ways. The degrees of digestibility of the ordinary kinds of food are well known—of meats, chicken, poultry, fish, shellfish and crustacea, eggs, milk, butter and cheese, bread and other cereal products, farinaceous and saccharine preparations, vegetables, fruits, and the many kinds of beverages, etc. Next to selection of the kind of food, the form of it can be so ordered as to simplify digestion. The endless number of dishes made from the foods just named afford abundant choice from this point of view. It is a fortunate circumstance that in acute disease, when the digestive functions of the stomach particularly are at a low ebb, the fluid food which must be prescribed, as we have already seen, is comparatively easily dealt with by the stomach and intestine. But this method must not be abused: fluid nourishment proves very flatulent in cardiac cases, for example. We have seen also that one of the simplest and surest methods of insuring the digestion of food in disease is to restrict the amount of it, and to regulate the frequency of its administration; and it is far better to attain the desired end in this way than by prohibiting a number of articles altogether.

The digestion of invalid food can be promoted indirectly

by increasing the digestive activities of the alimentary canal. Stimulants of the appetite, palate and salivary glands, and of the gastric and intestinal nerves, circulation, glands and muscles, have this action when given shortly before meals, and are extensively employed, particularly during convalescence. A short rest before meals has the same good effect; and we may repeat that every well-ordered well-appointed meal is a stomachic tonic in itself of the best kind. It may appear remarkable at first sight that there are limits even to the advantages of digestibility of food for the sick. The functions of the stomach and bowel tend to become impaired by complete or protracted rest; and the habitual employment of pepsin and pancreatic preparations for the purpose of completing the digestion of a large meal is unscientific and unsound. At certain stages of convalescence, as we saw in Chapter V., change must be made from liquid to semi-solid, from semi-solid to solid fare. Sir William Roberts suggests that tea and coffee act beneficially on the stomach in part by retarding digestion.[1] There are also conditions in which gastric digestion is left uncompleted with advantage. Certain articles of diet are deliberately selected because a large residue leaves the stomach undigested and serves to excite the peristaltic action and glands of the bowels when these are feeble; such are whole-meal, fruits, etc. In yet another class of cases the other extreme is indicated—complete readiness of food for absorption independently of gastric digestion; and this is attained by ordering peptonised preparations. Indeed nutrition has often to be maintained whilst every function of the stomach is in complete abeyance for a time; and then recourse is had to the rectum.

In the *intestine* food and its products excite similar activity of glands, vessels, nerves and muscles to that of the stomach. The result is further digestion and complete preparation for absorption, which is carried on throughout the whole length of the bowel, including the rectum, under the stimulating influence (*inter alia*) of the presence and character of the products and residues of digestion. With the excreta added

[1] W. Roberts, *op. cit.*, p. 140.

to them the food-residues excite peristalsis and secure their own evacuation.

In dietetic treatment every advantage is taken of our knowledge of these physiological actions of food on the intestine, and also of the fact that here also all the functions of the parts concerned—digestive, absorptive, excretory, propulsive—are lowered by disease. Thus when the bowel itself and the related parts are disordered or diseased, we may order diet either to afford them rest or to increase their functional activity according to the indication to be fulfilled; and we accomplish these ends by means of the kind, the composition or the quantity of the food. Thus we allow water only, and this sparingly, in acute appendicitis; we insure perfect gastric digestion in chronic dysentery; we order brown bread, green vegetables and salad oil in atonic constipation. Anæmia from deficient assimilation is also met with an aperient diet, quickened peristalsis promoting absorption and sanguification. The same rule applies in some degree to the treatment of disease of every kind. The bowels must be moved regularly during illness, particularly when repair is active; and this consideration is kept before the mind in ordering diet. The removal of excreta is but a small part of the result of this provision. Absorption is promoted at the same time, as we have just seen; the passage of food-products is facilitated through the bowel, and into the bowel; and thus gastric digestion is quickened, and indeed the appetite itself.

Actions on the Blood, and Specific Actions and Uses.

By the time that the products of the assimilation of food enter the blood and tissues, its proximate principles have been rearranged; and they severally—the proteids, hydrocarbons, carbohydrates, salts and water—affect the different parts of the great metabolic processes in association with oxygen conveyed by the hæmoglobin. Stated comprehensively, the result is *nutrition*. Naturally we possess in food the most powerful, ready and convenient means of influencing the activity and structure of the force-producing organs, that is, of every organ and cell in the body; and this not in a general

way only but in detail, certain aliments being recognised as force-producing, others as calorifacient, others again as flesh-formers, fat-formers, and so on, respectively, whilst some foods, particularly tea, coffee and alcohol, subserve the higher functions of the nervous system instead of the needs of general nutrition.[1]

It is as a source of nourishment and the only source of nourishment that food chiefly concerns the therapeutist in search of means of treatment. Interesting as the other actions and uses of food are, which we have studied partly or have still to examine, they are of but secondary importance compared with its essential position as nutriment or nourishment, the ultimate source of all vital energy. Therefore the first property that a food must possess when it is ordered for the invalid is that it be nutritious. In disease even more than in health a continual decomposition of food is necessary in order to obtain vital force, that is, to support life and anatomical soundness—to supply the demands of general nutrition, and of growth and development also in the young. But this is only a small part of its employment in treatment. Food is the principal means of fulfilling the all-important indication *to compensate for the increased waste* of strength and substance which attends the exhausting processes of inflammation, fever, degeneration and new-growth; the malnutrition attending the same diseases, as well as intrinsic disorders of the metabolic processes themselves, such as diabetes and obesity; and the impairment of the alimentary and assimilating processes usually associated with the functional disorders, debility and distress constituting so large an element of illness. In other instances the poverty of nutrition which has to be relieved by a free supply of nourishment originates in want rather than in waste. But beyond all this, the heavy demands made upon nutrition in disease by *the processes of recovery* must also be supplied by food. We have recognised these demands in our study of repair, in hypertrophy, in the protracted processes of removal of products, and in maintaining the preliminary struggle of phagocytosis. The extraordinary need and relish for nourishment during re-

[1] W. Roberts, *Brit. Med. Journ.*, London, 1890, vol. ii. p. 883.

covery are most readily appreciated in surgical cases, but they are also striking in chronic wasting diseases like tuberculosis. When recovery so-called is practically ended, the demand for increased nutrition continues, in order to provide for the complete restoration of health which occupies *convalescence*. There is but one way to re-accumulate the store of potential energy which perfect health signifies, and that is to replenish it by means of food. At the same time it must never be forgotten that in disease and the comparative rest which accompanies it the function of metabolism is perverted, like the functions of the mouth and stomach which we have studied, as is proved by the nervous and muscular debility, by the derangements of all the excretions, and by the occurrence of such affections as glycosuria, functional albuminuria, azoturia and obesity.

Bearing all this in mind, we conclude not only that a sufficient amount of nourishment is called for, but that different kinds of foods may be employed to fulfil the different indications. Some are calculated to correct nitrogenous waste, some to compensate for loss of fat; some will neutralise the effects of the destructive factor of disease, some will supply the materials demanded by repair; other foods again will furnish suitable material for the vital energy which the body must possess throughout the whole process of recovery, and which in particular has to be displayed during convalescence. Manifestly judgment will be called for in ordering invalid diet, lest disturbance instead of improvement of nutrition be the result.

In acute disease nitrogenous foods of animal origin furnish us with ready means of meeting the consumption of both tissue- and circulating proteids. The many derivatives of meat, milk, and eggs constitute our staple materials of this kind. Under the same circumstances an abundant supply of water is absolutely necessary. In less urgent but still exhausting conditions, such as the subacute infective processes, new-growths and degenerations, cereal products answer the same purpose, only somewhat less rapidly; bread and other preparations of flour are the type of food of this kind. In all but the most acute forms and phases of disease the hydrocarbons,

whether as fats and oils, or as contained in eggs and in milk and its derivatives, and the carbohydrates (saccharine and amyloid substances of endless variety) are essential constituents of a nutritious diet. They help to sustain the vital forces, to spare tissue-waste, and to build up new tissue in repair and growth; and they are peculiarly valuable in convalescence. In all morbid conditions the nutritive value of vegetables and fruits of different kinds is to be remembered. It is but seldom that some or other of them may not be given with safety and advantage; occasionally, as in scurvy and diabetes mellitus, they may serve to fulfil exactly the indications for nourishment presented by disease. Water should be freely allowed in subacute disease; and broadly speaking is far too little employed in treatment. The specific actions of alcoholic beverages in different forms have always to be considered in ordering diet, whether for acute or for chronic disease, and definite instructions given for or against their use.

An important class of diseases appear to consist in derangements of metabolism in the widest sense of the term, particularly gout. Although the pathology of these diseases is still but imperfectly determined, there is a fairly general consensus of opinion that diet as a whole and in detail is an essential means of their treatment. But with respect to this point, and indeed with respect to all our attempts to employ food as a means of influencing nutrition, we must be careful not to attach undue importance to what we may regard as scientific considerations. Our knowledge of this part of physiology is still so imperfect that we cannot afford to make light of experience; and the wisest course that we can follow is to order and regulate our dietetic treatment of metabolic disorders rather by carefully observed results than by theory.

Remote Local Actions and Uses.

The chemical products derived from the elements of food when they have passed through the blood and tissues are eliminated by the bowel, kidneys, skin and lungs. Nitrogenous products pass out mainly in the urine and fæces;

carbonic acid and water derived from the carbohydrates and hydrocarbons escape in the air of expiration as well as otherwise; the salts and the water, greatly re-arranged in their chemical combinations, are excreted through all the four channels. Although the elimination of these different substances appears to be a simple affair, the therapeutist finds that he cannot afford to disregard it when he is planning invalid diet.

Besides the usual physiological reasons for insuring complete removal of the products of food from the system, several considerations have to be kept before our minds in connexion with this subject in disease. The first of these is that elimination is already under heavy strain, consequent on increased waste and repair, whilst all the organs concerned are more or less disabled or impaired in their activities, partly by the morbid process directly, partly by the enforced rest and confinement inseparable from the treatment of many diseases. In the second place, the food of the sick is usually made particularly nutritious, attractive and digestible, as we have seen, and the amount of egesta will be correspondingly large. Thirdly, the disordered metabolism of disease may give rise to certain products more difficult to eliminate than those of health, particularly uric acid; the water gets diverted from the kidneys; and all the excretions present characters (in fever, for example) suggestive of complete chemical disturbance. Acute gout may be cited by way of an extreme instance of several of the effects on the excretions referred to. An attack often originates in enforced rest after an accident, combined with invalid feeding; and the urine speedily reveals how marked the chemical disturbances are within the body. On the other hand, the familiar effect for good of a regular laxative during illness is no doubt to be explained partly in this way.

Our knowledge of the chemistry of foods, of their products, and of the channels of their final excretion is now so extensive and exact, and the control which we possess over the ingesta so complete, that all that is required in ordering dietetic treatment which shall be suitable in respect of elimination is a little trouble and intelligent effort. First, we must never forget the total excreta to be disposed of in

illness. In this connexion we appreciate one of the chief advantages of a moderate diet, and of the absolutely spare diet indicated for many diseases. More particularly, we must consider when planning invalid diet how far the nitrogenous products can be successfully eliminated by the kidneys.[1] Difficulties and dangers occasionally attending the disposal of urea suggest the use of foods containing a minimum of digestible albuminoids—farinas, vegetables, fruits, fats, white meats; abundance of water; and other diuretic constituents. Milk fulfils these requirements as a food, and proves peculiarly valuable practically. Uric acid has to be more often if less anxiously regarded in planning invalid diet, namely in relation to gout and calculus, and those foods very sparingly ordered which contain a high percentage of albuminoid matters. The salts contained in the food or produced by its decomposition determine the reaction of the urine. There are alkali-yielding foods, such as fruits and vegetables, and acid-yielding foods, including an excess of meat, acid fruits, alcohol, etc. We here meet with many familiar beverages, such as the natural and artificial alkaline and saline waters, wines, beers, etc. Water, both as a constituent of the excretions and as the most important medium, vehicle or solvent of other excreta, is in this respect, as in so many other respects, one of the elements of diet to be regarded and ordered with particular attention. It is so familiar or ordinary, however, that it is habitually forgotten both by patients and doctors, unless an artificial interest be attached to it by ordering it hot or prescribing a course of water-drinking at a spa. The appearance in the excretions of certain morbid products, sugar especially, has to be considered in ordering the diet in disease.

A word of caution is necessary here again. Too much may be made of chemical therapeutics of this kind. It looks as if we simply had to give acids, alkalis, waters, nitrogenous food, etc., as may be indicated by analysis of the urine. This is an error. The processes of digestion and metabolism, as well as the personal factor, must never be ignored. See *Gravel and Urinary Calculus.*

[1] Munro Smith, *Bristol Med.-Chir. Journ.* vol. vii. 24, p. 77.

EXERCISE.

The term "exercise" has several different significations. Popularly, exercise means physical or muscular exercise. More correctly it includes physiological exercise also—exercise of the heart in systole, of the bowel as a propulsive tube, of the stomach as a secreting organ, of the brain in intellectual and moral education. Again, "taking exercise" is often applied to single casual acts or efforts, such as a walk or a game of golf; whereas from the point of view of the therapeutist it implies the methodical systematic employment of active organs, muscular, nervous, secretory, etc., graduated and arranged as a whole to effect definite ends. It is in this sense that the term is used here. What is sometimes known as "passive exercise" consists of manipulations, massage, etc., and will be referred to incidentally only.

Methods and Forms of Exercise.

By far the most common as well as the most obvious way of exercising an organ is to *throw more work upon it.* This is otherwise known as raising the load, increasing the weight or the resistance, and calling for larger results or more products. The voluntary muscles are exercised by walking, running, cycling, rowing, swimming and other out-door occupations and amusements of every kind, as well as in the gymnasium. The amount of energy obtained from the left ventricle of the heart is increased by filling it more rapidly with venous blood and raising the arterial tension in muscular exercise. The bowels are exercised by means of food in such quantity and of such a kind as will leave a considerable residue of undigested material; and also by care not to evacuate them severely but to leave a sufficient amount of undischarged fæces to provoke peristalsis. The stomach is exercised by generous diet. Cerebral activity is heightened by closer intellectual occupation of a wholesome kind. Instead of an increased amount of work, *increased frequency* of periodic work may be employed to exercise organs. This is the

same as diminishing the period or phase of rest in rhythmical action, a method best illustrated in the heart.

The second method of exercising active organs is by the action of *stimulants*, medicinal and non-medicinal. Electricity belongs to this class. The heart displays greater energy under the influence of digitalis and other specific cardiac stimulants. The peptic action of the stomach is quickened, the stomach is exercised, when a well-planned combination of alkalis, aromatic bitters and a trace of alcohol is given systematically a few minutes before each meal for several weeks. Constipated bowels are regulated by means of a habitual pill of aloes and strychnine until they regain the muscular tone which they have lost.

Lastly, exercise can be effected by *removing vicarious assistance*. In convalescence patients are encouraged daily to walk with less and less help from nurse and stick: the indolent adipose individual is set down from his carriage and compelled to find his way home by himself. The stomach is exercised by cutting off pepsin or peptonised food and ordering ordinary diet. The effect of diuretics is increased by keeping the skin comparatively cool and the sweat-glands in check; and *vice versa*. We thus compel in an organ a system of self-reliance, as it were, by removing extraneous assistance, and re-establishing it in a position of independence. In the same way an indolent youth may be treated most successfully by being relieved of his tutor and taught to lean upon himself.

Necessary Conditions.—When an organ is deliberately exercised, whether directly or indirectly by one of these methods, certain conditions have to be insured at the same time in order to make it a success as a means of treatment. The nutrition of the organ has to be maintained by promoting an abundant supply of arterial blood, to bring it plasma and oxygen, and also a free venous outflow. Complete elimination must be provided for. Wholesome nervous influences must be insured. Unfortunately as a result of disease or debility some or all of these conditions are apt to be imperfect in the very cases which call for exercise, including convalescence. To make exercise a success as a method of treatment time is also necessary. This is implied indeed

in the accepted meaning of the term exercise—that the organ is brought into action repeatedly and regularly for a length of time, the ease and completeness of the result increasing steadily, and care being taken to begin very cautiously and to proceed in graduated fashion. Lastly, it must be employed with moderation in respect both of degree and of duration. As a means of hygiene, wholesome recreation and treatment, exercise is readily abused. Exhaustion instead of simple fatigue is the result, distress instead of pleasure and satisfaction; and there follow other evils which will be noticed more conveniently when we come to speak of the uses of exercise.

Actions of Exercise.

When an organ is exercised, certain associated events accompany the display of energy. Whilst muscular, nervous, chemical, electrical and thermic forces are liberated and work is thereby accomplished — respiratory, cardiac, vaso-motor, gastric, cerebral—the nutrition of the cells, vessels, nerves and other tissues of the parts exercised is profoundly affected. The blood vessels are dilated and the circulation through them is markedly increased. Katabolism and anabolism become more active in each instance. Frequent methodical repetition of this effect in the course of exercise leads to development or improvement of the nutrition, vitality, and structure of the organ. Increase of work for a sufficient length of time gradually sets up hypertrophy, which we have already studied (page 75): the active elements of an organ grow under the influence of abundant work. This great physiological law is equally familiar to the physician and to the trainer. The heart grows in its proper muscular structure when its load is raised by increased intra-cardiac pressure. When one kidney is disabled, its fellow becomes hypertrophied in consequence of increased excretory labour. One of the means of recovery from damage of the brain by hæmorrhage is compensatory action of other parts of the cerebral cortex under the influence of well-arranged exercises.[1] But exercise

[1] Gowers, Quain's "Dictionary of Medicine," vol. i. p. 194.

does more than this. With improved nutrition and increase of the amount and quality of the active tissues of the organ under the influence of exercise, there comes fuller development of its functional *capacity*, measured by the amount of force which it could display as distinguished from what it does display; that is, its ability to meet any severe demand that might be made upon it. We maintain a high level of functional capacity in a muscle fibre, in a nerve cell or in the stomach by giving it work to do: by continuing to evoke active energy from the potential charge in its elements. This physiological law again is in conformity with popular experience. The more work we have to do, it is said, the better it is done, that is, the greater the capacity of our organs for accomplishing it. Nothing makes our organs more fit for present work, or more prepared for an emergency, than full and constant occupation; whereas they readily "fall out of form" as the result of relaxation. This local effect of exercise is attended in man (and obviously in animals) with a sense of exhilaration and enjoyment. Under the demand for increased work, the improvement in nutrition and the growing functional capacity spread first to parts related to the organ exercised, and thence through the body. It is scarcely necessary to dwell on this subject, at any rate in Great Britain and America, that exercise raises the working power of the system generally, although it might not be obvious at first that health depends on work and waste of the active organs. The Anglo-Saxon spares neither nerve nor muscle, and holds that he is never so well and never so happy as when he is at work—nay more, that work is one of the best means for restoring health and happiness in many instances. "The decay of muscle and of organs," says one of our greatest authorities on life-assurance, "is precipitated by want of use; and the due exercise of all faculties of mind or body is conducive to longevity."[1] The same physiological truth is to be learned by observation of the source of the simple disturbances of the individual functions. The sluggish bowel in habitual constipation returns to health and normal vigour if we re-establish the natural physiological stimulus of a

[1] James Pollock, Quain's "Dictionary of Medicine," vol. i. p. 1114.

reasonable bulk of fæces, the avoidance of excessive evacuation, and the healthy nervous incitement to movement which is begotten by habit.[1]

It will be observed, then, that when an organ is exercised two associated effects are obtained: (1) *work is accomplished*, and (2) *nutrition is modified*. Sometimes the therapeutist uses exercise to secure the former of these effects, sometimes to secure the latter, sometimes to secure both. It will simplify the present discussion to keep them as much as possible distinct from each other.

Uses of Exercise.

Exercise is employed, in the first place, for the purpose of obtaining an *increase of the amount of force liberated* by the organ, the output, the products of its activity. Professional athletes and indeed also amateur athletes exercise their muscles in order to cover a distance or lift a weight more successfully than their rivals. The failing heart is exercised, whether by means of digitalis or by graduated movements, in order that it may accomplish more perfectly the circulation of the blood which threatens to accumulate on the venous side. The stomach is gently and methodically required to digest more and more solid or substantial food in convalescence, mainly because more nourishment is required by the body. The mind is educated in only too many instances less for the sake of training than to enable the candidate to pass a single examination. In all these instances, and in many others that might be cited, the use or object of exercise, primarily at any rate, is the direct return from the organ of its specific product.

Manifestly there is a limit to this useful employment of exercise. Acute strain may occur during severe exertion of the muscular organs; and short of this, complete exhaustion, pain, urgent dyspnœa, and other forms of distress and even syncope are not infrequent events. It is quite possible to exhaust the heart, stomach and brain by well-meant but excessive efforts in corresponding directions.

[1] Andrew Clark, *Lancet*, London, 1887, vol. i. p. 1.

When the brain is habitually taxed beyond legitimate limits (not by the difficulty or hardness of work so much as by the length of work and insufficiency of rest and sleep) there are developed gradually a series of evidences of "irritable weakness" instead of vigour. This is characterised by restlessness, impatience, flurry, irresolution, and the execution of work which is of inferior quality and without finish, though no doubt of increased quantity. Presently production ceases entirely, either suddenly or slowly: the organ has broken down. For a variable length of time there continues inability to return to work without recrudescence of the symptoms just mentioned. A consideration of great practical moment occurs to us in this connexion. As long as an organ or an individual works under physiological conditions, Nature compels rest at proper intervals, which prevents break-down. But in many of the cases of the kind referred to, work is accomplished under the influence of artificial assistance. Stimulants such as tea, coffee, and in the vast majority of instances alcohol, indeed possibly morphine, *enable the man to overwork himself.* This is overwork proper: work done by the aid of stimulants after the normal stock or store of energy is spent. The result is disaster. The practitioner must keep before his mind the limit of the usefulness of exercise in this respect. He must not overtax the failing heart with digitalis, strychnine, alcoholic stimulants or food lest he exhaust it entirely. He will have frequent occasion to peremptorily interrupt muscular and nervous overwork of the kinds referred to, as well as others—a very difficult task when resort has been had to artificial aids so long as to have established evil habits.

The second use to which exercise is turned is *improvement of nutrition, structure and capacity.* It is for this purpose that muscular exercise is taken by the majority of young men and women, and for this purpose that it is ordered in most instances: to invigorate the circulation, to improve the vitality of the protoplasmic structures, to prevent atrophy of paralysed or otherwise disabled parts, to promote hypertrophy if it be required: to raise the working capacity, to perfect the rhythm of action, to maintain or restore as the case may be normal periodicity of habit; to promote absorption of inflam-

matory products, to prevent or even break down adhesions. Torpidity, "want of tone," "slackness," and flabbiness of substance are banished far more satisfactorily by bodily activity, systematically practised, than by means of so-called tonics. It is the same with our organs individually: the feeble heart of the gouty individual, the atonic stomach of the chronic dyspeptic, the costive bowels of the sedentary woman, the dull intellect and weak morals of the neglected or ill-trained youth. In each instance a rational means of treatment is wholesome exercise under the influence of their natural stimulants respectively. The gouty heart is remedied by graduated muscular exercise, which fills the cardiac chambers with more blood, raises the peripheral resistance, and thus calls on the myocardium for increased effort. Atonic dyspepsia is met by well-planned exercise of the gastric vessels, nerves, glands and musculature, evoked by a generous but digestible diet, stomachic drugs, and cheerful appetising influences during meals. The costive colon is not washed out mechanically with enemata (unless specially indicated), but stimulated by an entire reform of diet, eating, clothing and occupation, and by respect for the physiology of defæcation and intestinal action as a whole. The vicious youth may be reformed as successfully as is the indolent by being given wholesome employment. In each of these instances, and in many others, evil dispositions and habits are dispelled by exercise and proper occupation.

One important application of exercise is *to improve the vigour of the body as a whole*, "the general health." We have seen how the beneficial effects of exercise on one part spread to other parts. The chief direction in which this important physiological result applies is of course muscular exercise. The voluntary muscles are the organs which in every respect are best calculated and adapted to be exercised for the purpose of quickening and benefiting related organs, that is, every organ of the body in its entirety. They constitute nearly one-half the body; they are under easy control as often as we care to use them; and they are the means of accomplishing feats not only of strength but of dexterity and skill, with grace and dignity and a sense of exhilaration. Muscular

exercises are used accordingly as one of the chief means of hygiene, of restoring health and strength during convalescence, and indeed of remedying a considerable variety of disorders and diseases—of the blood, metabolism, liver, stomach, heart, organs of respiration and nervous system. Within the last few years important improvements have been made in the direction of regulating, graduating, systematising different exercises; but in Great Britain and America out-door games and sports are still, and are likely to continue, much more popular than gymnastics or the many systems of movements and mechanical "cures" in vogue on the Continent of Europe.

Perhaps the most familiar and popular of the uses of exercise is as *a means of affording wholesome pleasure in a pure atmosphere.* As we have seen more than once, physical exercise—indeed the correct exercise of every natural function—is accompanied by a sense of enjoyment. Within reasonable limits this effect is beneficial to the body directly. In the case of muscular exercise it is also beneficial indirectly, and to a far greater degree. Muscular exercise when properly arranged is taken in the open air or at any rate in the fresh air. The chief sports of Britain and America are held out of doors; a few of them in lofty, well-ventilated buildings. Thus the town-dweller is attracted or compelled to spend part of each day or at least part of each week out of the unnatural and unwholesome atmosphere of workrooms and living rooms. Great benefit cannot but come to the individual and to the race as a whole from the modern development of cycling, were the effect of it nothing more than to carry thousands of young persons every few days into the country with all its refreshing influences.

It is hardly necessary, however, to say that abuse of exercise is too often committed, and must be prevented by timely warning. Even with these very proper ends in view—the improvement or restoration of structure, function and capacity, both locally and generally—exercise is often carried too far. Its beneficial effects on an organ, both immediate and remote, functionally and structurally, then pass into disturbance, distress and damage. The immediate phenomena of exhaustion, as distinguished from

wholesome and agreeable fatigue, are familiar to all. Exhaustion is felt, and is plainly visible. Pain is complained of in the parts that have been over-used: headache, backache, eye-ache, and particularly aches in the limbs; and it persists or readily returns, as distinguished from the healthy feeling of tiredness left by ordinary effort. The pulse and temperature are raised, as we study in convalescents after the visits of their friends, however agreeable they may be; the appetite and sleep are very readily impaired. If the effort have been made by a person actually ill or but imperfectly recovered, local distress and disorder are the results of what ought to have been a pleasing useful change: pyrexia, pain, cough, and possibly aggravation of hæmorrhage, inflammation, suppuration, ulceration or dropsy, or at least local swelling and weakness. These effects and others may be observed in pulmonary tuberculosis, enteric fever, gastric ulcer, cardiac disease, chronic rheumatism and the like. It is obvious therefore that exercise like every other valuable means of treatment is readily abused, misused or misapplied. Because it is so powerful, so readily available and so pleasant amongst remedies, the greater is the need of judgment in ordering it, of watchfulness in observing its effects, of caution lest it be carried too far. Whether it take the form of muscular movements, of sport, of gymnastics, of mental occupation, of particular kinds of food or of physic, it must be apportioned to the age, sex, habits, circumstances, and naturally to the state of health, convalescence, disorder or disease of the person for whom it is prescribed. In most instances the amount and frequency of it prescribed are moderate at first and are increased gradually. The guides to be employed are on the one hand improvement locally and generally, on the other hand the evidences of overwork which have been enumerated. When any of these occur, particularly when they recur and persist, the practitioner must retrace his steps. This is quite a common occurrence in convalescence from fevers, injuries, cardiac lesions, internal inflammations like hepatic abscess, dysentery and gastric ulcer; and especially in affections of joints and nerves, such as chronic rheumatism, gout and sciatica. The necessity of time as

one of the conditions of benefit from exercise is too often forgotten.

REST.

When studying the natural history of disease in search of indications for treatment we had frequent occasion to refer to rest. We discovered that it is naturally secured by pain and other forms of distress, by the debility and sense of illness which attend disease, sometimes even by muscular action! In many connexions rest proved to be an important indication for treatment. Both independently and in relation to exercise and work, the principles on which rest may be employed as a means of treatment demand close consideration.

Rest as a therapeutical measure includes physical and physiological rest. Physical rest consists in mechanical restraint of movement by means of bandages, splints, etc. Physiological rest consists in reduction of the specific activity of the bodily organs—muscular, nervous, secretory and others. Different degrees of rest, whether physical or physiological, are employed—complete rest, entire rest, moderate rest, and relaxation.

Methods and Forms of Rest.

The most obvious method of resting an organ is to *unload it or relieve it of its work or function*, wholly or in part. We rest our muscles voluntarily, and with them the entire body, by recumbency, which unburthens them of the weight which they have constantly to support. The overtaxed heart also is rested by this means, which reduces both the arterial resistance and the influx of venous blood. Nitro-glycerin produces the same effect in the first of these two ways. We give the stomach complete rest by withholding food entirely. Peptonised food relieves the stomach of its work of secretion, that is, affords rest to the glands, whilst the muscles, nerves, vessels and absorbents continue active in various degrees; and we can insure more or less gastric rest by ordering diets of different degrees of digestibility and different amounts. The brain of the man of business may be rested by sending him on a

long sea-voyage where neither newspaper, letter nor telegram reaches him, or by ordering him to give up a certain portion of his work. The eye is rested by means of a bandage or darkened glasses; the ear with a plug of cotton-wool.

However simple this method may appear in theory, it is beset with difficulties in practice, and obviously so. Absolute rest, as such, even for a short time, in respect of organs like the heart and lungs is incompatible with health and indeed with life. Their functions will have to be carried on whilst the organs rest. Neither can we always compel rest by direct means. Patients may positively refuse to rest either their brains in insomnia or their bodies in aneurysm. It is clear that when employing rest therapeutically we have to do more than order it and attempt to enforce it. The amount, kind and form or manner of rest must be ordered, and the individual considered, with as much judgment and discrimination as we employ in prescribing diet and medicine. Under these circumstances we do well to bear in mind the different ways in which organs can be relieved of work *indirectly*. These will now be reviewed.

Vicarious help is an important method of securing rest of an organ indirectly. We have already traced this as a natural provision in a large number of the organs, and have seen how it is indicated as a therapeutical measure. The kidneys can be relieved of part of their work, and rested *pro tanto*, by an appeal to the skin and bowels. Rectal feeding satisfactorily replaces for a time the function of the stomach, which is thus afforded absolute rest. The peculiar advantage of vicarious help as a therapeutical method is clearly seen in this instance: it affords rest of the organ without cessation of the function as far as the body is concerned. What one organ does for another in this way a portion of an organ or system does for another portion in difficulty. The lungs enable each other to rest in pleurisy and pneumonia by taking on extra work. The thoracic come to the help of the abdominal muscles when there is urgent need for them to rest; and the therapeutist takes advantage of these and similar natural provisions in many instances. At the same time, as we have already seen, vicarious action requires to be

assisted, directed, controlled and altogether used with discrimination. As a method it is precarious; its limits are readily exceeded; it involves a second organ in difficulty. The heart comes to the help of the lungs in acute pneumonia, providing by increased circulatory activity for oxygenation, which is imperilled by loss of respiratory area; but cardiac failure from this cause amongst others is the most dangerous feature of the disease.

When the work of an organ is discontinuous, periodic and possibly rhythmical, another obvious way of affording it comparative rest is by *advantageous distribution of its work*. The heart is rested indirectly by increasing the length of diastole. Instead of a number of beats with short intervals, a powerful systolic contraction is followed by a relatively long pause, during which time the blood pressure is maintained by the force thrown into the elastic walls of the arteries in systole. Energy is thus economised and time afforded for cardiac rest and nutrition, a very advantageous dynamic arrangement. Increased activity is associated with an increased amount of rest. On the same principle we insure better disposal of the time devoted to intellectual work by shortening the hours of labour, and making this more effective whilst it lasts. In this connexion it is important to observe that the period of rest must be devoted to rest only; that rest must be complete. Rest of an inflamed or injured part means the most perfect and continuous immobility that can be secured.[1] This rule is consonant with experience. That man is most successful, accomplishes the best work, and withal maintains his health most perfectly and for the longest time, who works hard whilst he is engaged, and takes complete rest when he is disengaged. It is the same with each of our organs; and we must keep this physiological truth before us in ordering treatment. A young woman with a weak spine is directed to have her definite exercises and then lie down flat on the floor instead of seeking half-support on or in a chair.

A fourth method of carrying out rest successfully is *diversion*. The brain of the neurasthenic remains active and excited until there is provided for the escape of its energy

[1] Thomas, *op. cit.* p. 6.

some fresh channel which is perfectly safe, such as sport, gardening or farming. He thus rests whilst he is occupied and believes or at least feels that he is working. The business man who has never learned to be idle is even more difficult to control, or to treat with rest, when his brain or heart or kidneys ultimately break down and he has no taste or "hobby" to supply him with pleasing occupation. Such persons may sometimes be benefited by being given innocent worries. Games of skill involving moderate exercise are also very useful in these circumstances, such as golf in the day and billiards in the evening, which arouse pleasing excitement. Foreign travel is another method by which rest can be afforded by diverting occupation. A man who would refuse to be idle at home will spend his time abroad quite cheerfully in a new atmosphere over sights and places of interest. There is of course a limit to this device. Diversion may be carried too far. Two organs may be over-worked instead of one. Anxious nervous men frequently abuse muscular exercise when employing it as a means of resting the brain. The nervous woman exhausted by illness and family cares readily overtaxes her strength instead of resting when she is sent to town for a change, and may indulge too much in concerts and the play. These are but ways of correcting one mistake by committing another.

Whatever method may be adopted of obtaining rest for an organ, *rest begets rest.* It is doubly important therefore to make a beginning. How this happens and how it may be applied therapeutically we shall see presently.

An entirely different order of means of resting an organ is furnished by *sedatives.* Many drugs possess the power of diminishing the activity of organs and thus securing their rest. Opium is the most powerful of all sedatives, both in degree and in the remarkable range of its action throughout almost all the organs of the body. The many nervous and muscular sedatives and the drugs which possess specific effects in the same direction on the different organs respectively—the heart, stomach, uterus, bladder, etc.—need not be enumerated. In addition to drugs, a great variety of remedies in popular and professional use act as sedatives and promote rest. These include the external application of heat and cold in different

instances; gentle rubbing or stroking; some forms of electricity; certain baths; the influences of impressions on the senses, such as pleasing sounds (especially music and quiet reading), different degrees of light and different colours; and of course many circumstances which directly influence the mind—the presence of a trusted friend (or even a trusted drug), a cheerful word, a favourable report, a confident expression and manner on the part of the practitioner, the removal of anxiety. In hæmorrhage, in fever, in delirium, and in cardiac disease, for example, rest may sometimes be secured more successfully by these than by any other means.

Entirely *artificial assistance* can be afforded to some of the organs so as to permit their temporary rest for therapeutical purposes. There are endless varieties of surgical appliances which insure mechanical relief and quiet, from the simple bandage, splint and crutch to the elaborate apparatus used in the treatment of diseases of the spine, joints, etc. The physician also possesses a few means with a similar action, such as pepsin and hydrochloric acid, which replace for a time the natural gastric juice and afford temporary rest to the exhausted or disordered glands of the stomach; and this method has been developed to an elaborate extent in the many forms of predigested food which we now employ when the alimentary canal is disabled.

Actions of Rest.

Rest is the negation of action; yet "the physiological actions of rest" is a convenient expression to employ in describing the effects produced in organs and in the body as a whole during rest and partly by rest. These are very numerous, but the principal of them can be set forth under the two following heads.

First, in association with rest, less work is done, less force produced or liberated, less secretion obtained. Tufnell calculated that the heart was spared 43,200 contractions *per diem* by confinement of a patient with aneurysm to absolute bodily rest in bed.[1]

[1] Tufnell (Joeliffe), "Successful Treatment of Internal Aneurism by Consolidation of the Contents of the Sac," 2nd edit. 1875, pp. 62, 63.

Secondly, in association with rest, certain changes occur in the tissues: fatigue is removed, both subjectively and as tested by stimulation; function is restored; and energy re-accumulates in potential form. Strain, weight and mechanical pressure of parts on each other are relieved, as is seen in connexion with the spine and joints. The activity of the local circulation is lowered. The irritability of the nervous mechanism of the part is reduced. Muscular strain is removed, and the irritability of the associated muscles is also quieted. Local anabolism is promoted; local katabolism is checked. Local rest is also the starting point of an important series of remote or general effects. The general circulation is quieted; so is the nervous system, and sleep is promoted. General anabolism is favoured; general katabolism is restrained. Thus other parts are put in favourable circumstances for rest. Local rest thus (and otherwise) promotes general rest. Rest of the voluntary muscles comes in this way to be a powerful influence in resting all the viscera, such as the heart, lungs and stomach, constituting as the muscular system does so large a proportion of the whole body.

Uses of Rest.

The therapeutical uses to which rest is turned naturally fall into two great orders, according as it is intended to secure the one or the other of its principal physiological effects.

First, rest is employed when our concern is with *the work accomplished* or secretion produced by the organ, not with the organ itself: its activity is deliberately reduced simply because for some therapeutic purpose we want less of the specific energy of which it is the source and instrument. Thus when the indication exists to lower the blood pressure in hæmorrhage or aneurysm, we rest the heart and the circulation as a whole. Our business here is primarily with the broken vessel-wall, not with the heart on which we impose the rest. Similarly one of the uses of rest in gastric ulcer is to check the secretion of the acid juice, which delays repair and indeed is believed to be an active agent of destruction.

Far more frequently, however, rest is used to obtain

certain physiological, mechanical, or structural *changes in the organ or part itself.* Thus, extensive use is made of rest to remove exhaustion: to restore the activity and capacity of the voluntary muscles, heart, brain, stomach and indeed all the different organs when they are exhausted by disease, disorder or over-use. Thus the heart is afforded rest by lightening the load of blood to be driven and lowering the peripheral resistance; and this both in primary disease and disorder of its own structures and mechanisms, and when it is exhausted by vicarious effort in acute pneumonia and bronchitis. Cerebral rest under corresponding circumstances of strain and exhaustion is an equally familiar application of the method. Some patients are directed to rest and even to sleep for a little time before the stomach is called upon to undertake the work of digesting a meal. Natural rest is especially necessary when exhaustion is the result of overwork done under the influence of artificial stimulants, and followed by artificial sedatives. This is by no means an uncommon form of cerebral and bodily strain. A man accomplishes more work than he is entitled to demand of his organs by taking alcohol to help him in the day and chloral to help him in the night. Both the stimulant and the sedative enable him to overwork himself—a process of exhaustion of the most complete and disastrous character. The indication here is to cut down the work (perhaps by indirect devices as we have seen) until the man can work, eat and sleep without artificial assistance.

Nearly related to this class of case is another in which rest is indicated and is successful, namely irritable weakness of nervo-muscular organs with exaggerated reflex excitability. We have seen how cough may drift into this form of disturbance, the exhausted respiratory centre refusing to rest, and how vomiting is protracted by sheer weakness. The bladder, the bowels, the blood vessels and particularly the brain exhibit parallel forms of unrest as a result of prolonged irritation by disease, disorder or strain. In inflammation there appears to be hyper-sensitiveness and restlessness of all the parts concerned: flushing of the vessels, spasms of the muscles, pain, disturbances of the secretions. Rest is urgently indicated for

all cases of this kind, and has to be secured in many instances by means of morphine, which breaks the vicious circle of unrest and irritability; and a beginning once made, rest begets rest as we have seen.

Rest is familiarly used to relieve injured or diseased parts from strain, pressure or other mechanical effects of an unfavourable character. This is the rationale in part of the extensive employment of physiological and physical rest of bones, ligaments, tendons, muscles, joints, spine, etc. Internally a most important application of the method is cardiac rest in acute endocarditis to prevent concussion of the valves. Rest also permits apposition, contact, adhesion, union of injured or diseased parts, in fractures, wounds, ulcerations, inflammations, perforations, and the like. We have already seen how it promotes limitation, demarcation, encapsulation under somewhat similar circumstances, as well as thrombosis in hæmorrhage, inflammation and infection. It need hardly be said that rest is used to prevent or relieve pain and distress of every kind and the sense of illness. Bodily and mental rest are artificially or automatically secured as far as possible in all kinds of illness. Speaking generally, recumbency is the posture naturally adopted, which insures the maximum of rest to the muscles and the circulation, relieves pain and other forms of suffering, and promotes sleep. Both man and animals withdraw naturally to secure rest and be left undisturbed when they are unwell.

Lastly, rest is ordered as an essential means of promoting repair of injury or disease. Rest is calculated to fulfil this radical indication in a remarkable number of different ways. It checks katabolism; it favours the increased anabolism which is required; it controls vascular reaction; it prevents or removes mechanical strain, impact, etc.; it subdues "irritable" disturbances locally and reflexly of vessels and muscles; it prevents or arrests hæmorrhage; it promotes demarcation, localisation and adhesion, as we have seen; it relieves general bodily and mental unrest and favours sleep, appetite and digestion; and it quiets cardiac action and moderates temperature. Rest is an indispensable element of repair in all but exceptional cases. Nor can we afford to forget this in

convalescence. However pleasant and necessary exercise may be during convalescence, it must be absolutely shorter and less severe than during health. Rest must follow it at short intervals to begin with, and be complete and prolonged. This is necessary, both to favour the increased anabolism which is going on throughout the body, and to relieve the sense of fatigue which supervenes so early on effort during this period.

For whatever purpose it may be employed, rest should be employed *early*. If a pathological process be permitted to advance deeply, (*e.g.* arthritis), not only will there be more difficulty in arresting it, but repair when it does occur under the influence of prolonged rest will be more likely to cause serious impairment of the structure of the parts.

Drawbacks and Dangers.—When it is employed as a means of treatment, rest has its limits of benefit and usefulness. It is easily abused as we have already seen, and then may do positive harm instead of good. Unfortunately too there is a disposition to carry it too far: to employ it when it is not required; to make it too absolute; to continue it too long. Rest produces a sense of relief and comfort which encourages rest. The early fatigue, stiffness, and even pain which attend first attempts to return to work are misinterpreted as evidences of continued disease and indications for further rest: whereas they signify only temporary debility and would pass off with perseverance after trifling discomfort. The difficulty is obvious. There are few harder problems in therapeutics than to determine correctly the period at which rest of joints, stomach, heart, brain or body as a whole should cease and work be resumed. The difference of opinion which has prevailed on the subject of exercise in cardiac disease is alone sufficient to remind us of this.

If muscular rest be overdone, that is, if depression of the local circulation and increased anabolism be permitted to continue, or be interrupted only by short periods of activity, the accumulation of functional energy attains its limit, and the pabulum which reaches the tissues is disposed of otherwise. It is diverted to nutritive purposes, but not to the growth of

muscular tissue, which falls away and loses tonus; patients confined to bed for any length of time complaining that they grow "thin and weak." Meanwhile both locally and generally fat begins to make its appearance. In consequence of this and of other changes in the metabolism of the body, the structure of the active organs deteriorates *as* active organs; and on this there follow impaired activity and after a time reduced capacity for work. Thus function and structure act and react unfavourably upon each other. At the same time the eliminating organs also become relatively inactive, and arrears of excretion accumulate within the body, producing languor and further inertia of nervous and muscular organs. A vicious circle is now established.

How long is an organ to be rested? When may exercise be resumed with safety and benefit? The removal of the splints from a fractured limb; the commencement of active movement of a joint after the rest which has cured synovitis; sitting up for the first time at the end of acute pericarditis; the first step out-of-doors in convalescence; the return to business after rest for neurasthenia; the resumption of schooling and cricketing by a boy who has passed through an attack of choreic endocarditis—these are instances of the different forms in which this question is presented to the practitioner in his everyday work and causes him considerable anxiety. The problem is one of the most difficult in the whole range of therapeutics, but we may make the following comprehensive statements in accordance with the principles at which we have just arrived.

The time has arrived to stop rest and attempt work: (1) When the result desired from the method is attained—the fracture is firmly united, the arthritis is remedied, the wound is healed. (2) When a certain period has elapsed which experience teaches us is usually sufficient. This guide has frequently to be followed in the treatment of diseases of inaccessible parts like the stomach and brain. (3) When the symptoms of the destructive part of the pathological process, particularly pain, have quite disappeared and do not return on moderate use of the part. (4) When the constitutional condition is deteriorating seriously as a result of rest. Besides

these broad guides there are numerous specific and local guides to the condition of the different organs undergoing rest, particularly guides of a surgical kind, which do not call for notice here.

The procedure to be followed in changing from rest to movement or work is to make trial in a cautious, gradual way, and to ascertain the effect of exercise as we proceed by employing the tests of over-use given in the chapter on Exercise, page 222. If these phenomena are absent, or if (as is often the case) they appear but for a short time and disappear under continued use, then the change from rest is beneficial and is to be continued. On the contrary, if pain, exhaustion and the other ill effects there enumerated make their appearance, rest must be resumed for a time.

Certain details of a practical kind have to be observed: First, a little nourishment should be given before, during and after the first attempts; sometimes stimulants may be advisable. Sometimes a light meal is taken when the patient sits up for the first time after a severe illness. Secondly, a short sleep before rising is also a good preparation for the effort. Sound sleep generally follows it if it have been beneficial. Thirdly, care should be taken to encourage the convalescent in his advance towards recovery; but with caution, lest he abuse his strength and suffer relapse. Lastly, with respect to change from rest to exercise of a part, such as a joint, it is well at first to follow the tentative use of it during the day by complete rest during the night. See *Convalescence*, p. 164.

NERVOUS INFLUENCES.

We have already discussed at some length the important part played by nervous influences in the origin, processes, and phenomena of disease; and by the nervous system in determining the personal factor which has to be reckoned with in treatment. In addition to these subjects, there is another relation of the nervous system to disease and treatment which may be profitably studied here. Whatever the disease may be, and whatever the individuality of the patient,

certain nervous influences and certain nervous effects have always to be respected, and possibly may be turned to advantage as therapeutic means when we are planning and pursuing our line of treatment. The observant practitioner learns the correctness of this statement more and more every day. He is repeatedly defeated by nervous influences which at first he failed to appreciate; and gradually discovers that he succeeds by employing measures which act solely on his patient's mind. The part played by the nervous system in treatment is more fully recognised by the laity than by the profession. It receives indeed excessive recognition from patients' friends. The young practitioner concerns himself more with the investigation of physical than of psychical conditions: he is apt to overlook for instance the influence of worry and anxiety in maintaining disease and in interfering with treatment, and he trusts more to medicinal than to moral agents in his application of remedies. It is important that he should learn his position more correctly in this direction, and be careful that every favourable natural circumstance that is available is employed to his patient's advantage.

Kinds and Circumstances.

If we assume an ordinarily sensitive nervous system, and exclude personal peculiarities, what are the influences incident on a sick man for evil or for good which we have to control or turn to account in treatment?

Unfavourable influences form a very long and discouraging list. They include actual suffering, especially pain, and the anticipation of pain; dread of death, of disablement, of critical operations; the shock that attends the discovery of serious disease such as calculus or cancer, or the refusal of the surgeon to operate for its removal; anxiety about business, means, the settlement of one's worldly affairs, one's prospective profession, or it may be a marriage engagement; the distress and difficulties brought on one's family; confinement to bed, want of occupation, monotony, and possibly depressing surroundings, as in hospital; disappointment with the result of medicinal or operative treatment; interruption of habits,

and disability for social enjoyment; disagreeable physic, unattractive feeding, and troublesome dressings and nursing as a whole; and the novel experience of being nursed by a stranger, which upsets many men, and women too.

These depressing influences may be present, one or many of them, from the first. In addition to them, further troubles develop during the course of the illness, and as the direct effects of it. A kind of vicious circle is established, bad leading to worse. Patience, cheerfulness, hope and courage fail as the result of suffering and the other disheartening circumstances; and a process of demoralization sets in. "I have seen a few people," says Weir Mitchell, "who were ennobled by long sickness, but far more often the result is to cultivate self-love and selfishness, and to take away by slow degrees the healthful mastery which all human beings should retain over their own emotions and wants."[1]

Favourable influences that fall upon the nervous system during illness, few though they be, have to be carefully noted and weighed, not only because they may help to neutralize the depressing effects of the other class, but in order that they may be turned to good account, and yet wisely controlled lest by their excess they prove injurious instead of beneficial. They include the sense of relief from pain and other forms of suffering which is effected by successful treatment; reassurance in general, as regards the immediate and remote results and the duration of illness and incapacity; hope; the assurance and the consciousness of improvement; and, as collateral influences of a favourable kind, the attention and devotion generally of friends, nurse and doctor; the pleasing sense of relaxation and change from the serious work of life to light occupation of a literary or artistic kind; indulgence in innocent amusements, hobbies and habits such as smoking; and at a later stage, along with the incomparable delight of a sense of convalescence, the pleasures of release from the bed and from the sick-room, the return to the open air, change of scene, and finally the resumption of congenial work with full consciousness of fitness. In this connexion there is also to be mentioned the mental

[1] *Op. cit.*, p. 40.

calm and resignation which mercifully comes to all sufferers from disease, however severe, by simple lapse of time—the "becoming accustomed to illness."

Uses.

The principles of employing nervous influences as means of treatment which follow from the preceding review are few and easily settled, but the fulfilment of them involves considerable detail. Expressed broadly, they are to the effect that all the depressing nervous influences associated with disease are as far as possible to be prevented and removed; and that pleasing wholesome nervous influences are as far as possible to be substituted for them. There are many respects in which these indications are to be pursued.

Our first duty, next to a proper effort to prevent or relieve bodily pain and suffering of every kind, as we have already seen in Chapter IV., is to attempt the far more difficult task of *preventing or relieving distress of mind.* For this purpose we have to keep the more hopeful view of his condition before the patient, and sometimes to conceal the truth or part of the truth from him. This is a difficult task, in the presence of a grave, possibly mortal, disease, and when the patient is anxiously watching every change of expression of the doctor's face. Still more trying is our position when the patient's courage has to be sustained as the last hope of recovery. The supreme difficulty is reached when the momentous question is raised—"Shall we tell him that his case is beyond help?" The answer mainly depends on the exact condition and character of the patient. Accurate observation and quickness and clearness of judgment are invaluable here. If the condition be absolutely hopeless, and if there be nothing to be gained by delay or lost by speaking frankly, it is right to tell the whole truth. The question is usually asked in connexion with acute disease of the abdomen and chest such as intestinal obstruction, peritonitis, and pneumonia; in many other fatal diseases the mind is happily clouded by approaching unconsciousness. On the other hand, if there be reasonable hope, however slender, the duty of the practitioner is equally

clear. The patient must receive the full benefit of the hope. If he be a man cast in common mould as regards love of life and dread of death, expression must not be given to our fears in any form. The bare suggestion of death to such a man may turn the scale against recovery. Whilst we conceal nothing from his relations, we assume an air of confidence in the presence of the patient which we may not feel, and secure as far as possible from nurse and friends a promise of cheerfulness of expression and action. We confess to him that his case is "serious," but we do not call it "hopeless." In other cases of equal gravity we speak of a tumour as a "swelling"; cancer we call a "growth." Occasionally we meet with patients who refuse to listen to anything but the whole truth. They are naturally brave, are prepared for the worst, and insist on having it set before them. To conceal the truth under these circumstances would leave the patient's mind in a state of unbelief and unrest which would harm him more than full knowledge and lose us his confidence and respect.

In cases of less gravity, that is, in treatment generally, it is part of the duty of the practitioner, and one of the best methods of turning nervous influences to useful account in treatment, to inspire the patient with fortitude and cheerfulness. He reassures him with respect to the duration and result of the illness and his ability to relieve distress; and he is careful to dwell upon the more favourable features of the case and to acknowledge every improvement. The mere presence of the doctor at the bed-side may be of paramount service, as in cases of hæmorrhage and of heart disease. The immediate surroundings of the patient are made as pleasing as possible. Food and medicine are given in the most agreeable forms consistent with usefulness; and the same kind of attention is paid to every method of treatment employed. In the treatment of diseases of the eye, as Brudenell Carter says, a bandage is better than a dark room which deprives a man of companionship.[1] An effort is made to re-establish peace of mind in the matter of business and in social and family affairs. Advantage is taken of the smallest progress in the right direction to grant a little liberty as a practical assurance

[1] Quain's "Dictionary of Medicine," vol. i. p. 655.

of advance. "It does him so much good," the friends tell us, "to do a little and feel that he is getting on."

The *influence of relatives and friends* upon a patient, and of his immediate domestic surroundings, always demands the attention and control of his medical attendant, particularly when the management of his case, including nursing through an acute illness, is committed to his family. On the whole, a patient is better to be under the care of a stranger. He is disposed to despise the advice and directions of his own people, to argue and prove wilful and disobedient. He receives an amount of sympathy accompanied by visible anxiety which is demoralizing. We cannot compel a despairing wife to wear an expression of confidence and cheerfulness in the easy way we order a sedative draught, unless—which is often the best plan—we prescribe the bromide draught for her instead of for her husband. Besides all this, it must be confessed that men often complain how their women-folk worry them with attention and tempt them to rebel against authority. One of the uses of a trained nurse is to remove this source of irritation: to control the patient and enforce obedience to discipline. On the other hand, the presence of an intimate friend often serves as a nervous influence of value in the treatment of an anxious case, and may turn the scale favourably at the crisis. The patient acquires fresh confidence from the familiar voice and hand, particularly if he be the subject of cardiac disease or of an acute specific fever; and in a similar way an old friend by the bedside may have a more restraining effect in delirium tremens than a powerful dose of chloral hydrate. In these instances the friend remains with the patient for a considerable length of time. An equal amount of care and judgment is necessary in granting permission to a friend to *visit* the sick-room. The effect on both persons has to be carefully estimated beforehand. Sometimes great risk is involved —from obvious causes; often, on the contrary, not only is there no risk in letting a husband see his sick wife for a moment, but positive advantage may result from the interview if he exhibit as he ought hopefulness and confidence. This permission, however, is by no means free from risk. Friends usually stay too long, misled by a flush of excitement on the

patient's face, and exhaust instead of refreshing him. Cheerfulness under such circumstances may prove irritating, not comforting; and even during convalescence it is surprising how quickly a patient tires of attempts to amuse him. The medical attendant should not forget that in a measure this truth applies to himself, in particular at his evening visit, which ought always to be punctual to appointment and never unduly late nor protracted. It is scarcely necessary to add that under similar circumstances all exciting news, whether good or bad, must be strictly forbidden, unless it serve to remove a worry from the mind. It raises the temperature, impairs the appetite and digestion, and is followed by a restless night. Scarcely less disturbing are the visits of well-meaning but silly gossips, who go from one invalid to another croaking of evil, and comparing freely the unfavourable features of different cases.

The *mental occupation* of the invalid must be briefly referred to as an important influence to be regarded in treatment. When an organ or the body as a whole is the seat of disease, a cardinal rule in therapeutics is to secure nervous rest, and to remove nervous unrest as speedily and as completely as possible—its causes, its various manifestations, and its effects. We have already touched on the value of cheerfulness, encouragement and hopefulness in answering this indication. Distraction or diversion by means of occupation is another means to the same end. The patient forgets his troubles for a time if provided with some object of fresh and more wholesome interest. With children there is but little difficulty; they have their toys and picture-books. Adolescents are usually willing readers and interested in games. Women take more kindly than men to bed or the house. The labourer or mechanic appears to enjoy the physical rest which treatment in hospital entails, at any rate for a time. Our chief difficulty is with that class of men who have a profession or business on their mind. Literature of a light kind or out of their own line is the chief means of occupying their time with some amount of pleasure and advantage; but the practitioner must keep his eye on the class of book read, and the daily paper is not to be admitted into the sick-room without his deliberate permission. Art in different forms affords pleasing

rest to some minds jaded by the incessant labours and anxieties of mercantile or professional pursuits. The sense of illness, isolation and unrest is lessened for some patients, especially those suffering from protracted illness, by bringing a little domestic life into the room: a cheerful wife or daughter with her work, her simple conversation or a pleasant book, but always with watchful eyes and thoughtful mind which inform her when it is time to go.

In chronic diseases and disorders, when the patient is not confined to the house, mental occupation as a method of treatment by diversion is of even greater importance; and fortunately there is a much greater variety of means to provide it. In many cases a considerable amount of time and energy may be spent in those forms of exercise which afford relief and rest to the mind. The chief concern of the medical adviser in this direction at the present time is to forbid the abuse of these excellent therapeutical measures. The best means of relaxation of the kind are such as exercise the body moderately whilst they insure mental rest, or exercise the mind in a light, pleasant and novel way by directing attention and interest to some object external to itself. Golf, shooting, climbing, hunting, tennis, fencing are all suitable means, different in degree as well as in kind, of occupying the mind in chronic disorders of digestion, assimilation, nutrition and elimination, and still more in the different forms of impairment of the nervous system caused by nervous strain and town-life. On the other hand, ordinary walking, voyaging and fishing give the patient too much opportunity of being by himself and indulging in unwholesome solitary musings, anxious thoughts, and study of his symptoms. The constant attention, judgment and resource demanded by riding, driving and cycling make these forms of occupation particularly suitable for some classes of patients, whom nervous exhaustion has led to introspection and melancholy. Others again are more successfully treated by being induced to engage themselves in trivial interests of a more continuous kind, such as the garden, dogs, birds, horses, or even the vestry or local politics; but this method must not be abused. There is a disposition or proclivity of many delicate persons and invalids to give up to the poor, to the Church, or

to their friends the little strength which they require so urgently themselves. For women wholesome nervous distractions must in some respects be of a different order. For older persons of both sexes change of air, scene, and social occupation is more commonly ordered; and there is here a wide field for the exercise of the practitioner's knowledge not only of climatology but of human nature. "Change"—especially abroad—brings an almost endless series of refreshing nervous influences to the relief of the invalid; and most persons are much more docile, amenable to treatment or obedient to instruction, more likely to be on their good behaviour, when from home.

Whilst the practitioner carefully plans and directs measures of this kind, and expects his patient to be faithful to his instructions, he must not be forgetful of his own bearing and action in relation to the case which is in his hands. He must set an example to others—to patient, patient's friends, and nurse—in the display of those qualities of mind which he desires to see in them. Let him be kind, sympathetic and self-denying, but cheerful and confident; whilst he never fails withal to be precise, strict, exact and exacting, resolute, calm, self-reliant and tenacious of purpose. The exhibition of these virtues in himself will not only serve to sustain and revive the patient directly and to establish his faith in his medical attendant, one of the most powerful of all the influences which conduce to recovery: it will prove infective to those about him, and will impart a character of thoroughness and method to the general management of the case which will secure appreciation and confidence. At the same time it will be well both for doctor and for patient not to be thrown unnecessarily together. Familiarity need not exactly breed contempt for the doctor's skill, but it may dissipate wastefully the benefit which attends a strictly professional visit.

It is of endless importance that the nurse, who represents medical authority in the absence of the practitioner, should also display the qualities of mind that have been described. This must be seen to, by close observation of the manner and spirit in which she performs her duties. The highly trained nurse of to-day is not always the most tender, faithful or

hopeful of women. Another matter calls for remark in this connexion. Many medical practitioners do not appreciate the natural objection, even antipathy, which many patients—men particularly—entertain to being nursed by strangers; and perhaps no one who has not himself been seriously ill can realise what the routine of being strictly nursed really means. Both of these considerations should be fairly entertained when patients display restlessness under the discipline of the sick-room.

CHAPTER IX.

THE ART OF TREATMENT.

The Art of Treatment as distinguished from the Science of Treatment consists in the *employment* of natural means for the purpose of preventing or remedying a disease. The medical sciences have guided us in the previous chapters to the objects which ought to be attained if possible, and we have sketched briefly some of the principal means of attaining them. But these guides, essential though they be, are guides only. The art of treatment rests with the individual practitioner in the individual case. Should therapeutics as a science ever become complete, and the knowledge of it be in the possession of all, there would be as much room as ever for distinction in the practice of it as an art. Let us enquire how this art is to be acquired, and how it may be practised.

How the Art of Rational Treatment is Acquired.

The student and practitioner are taught the art of rational treatment in two very different ways. First, they learn it *theoretically* from treatises or lectures or other forms of systematic exposition in Medicine and Surgery. "Treatment" is the last subject in the series discussed under each disease: ætiology, pathological characters, clinical characters; pathology, diagnosis, prognosis and treatment. In our best text-books the account of the art of treating a disease is introduced by a brief discussion of the rational indications for treatment, gathered from the preceding sections. Direc-

tions are then given what to do, when to do it, and how to do it. The medicines and other means, including surgical measures, are named, and the manner of using them is described, as well as the difficulties, failures, etc., which may be anticipated. The directions for treatment are laid down dogmatically and made as practical as possible. "The patient," it is said, for example, "is to be put to bed, the bowels are to be opened with a brisk purgative, and a mixture prescribed consisting of three grains of carbonate of ammonium, twenty minims of tincture of squill and a fluid ounce of water"; and similarly with respect to diet and other measures. Suggestions are then made for modifying the treatment as the disease progresses, whether favourably or unfavourably, and in respect of possible complications and sequelæ and of convalescence.

In the more elaborate treatises on special diseases reference is also made to the treatment that may have to be followed in individual cases, in certain subjects, under different circumstances, and so on. But at the best the result is incomplete, and unsatisfactory to the working practitioner. It is notorious that book-learning frequently fails to bear the strain of practice. It is often said that Medicine, particularly the art of treatment, has to be learned over again when the student has left his medical school; or even that "the sooner one forgets what he has learned about treatment from books and lectures the better for his patients"!

There is an element of truth in this charge against the theory of Medicine. No amount of book-knowledge of the principles of treatment or of the means and methods available is sufficient of itself to make a good practitioner. He must be trained at the bedside, in the out-patient room, in the surgery, in the dispensary, over the individual patients as they present themselves. In conformity with this important consideration, the student of medicine is *practically* instructed by his clinical teacher with the patient before him, whether in hospital or in private practice, how to set about treatment; and every case that afterwards comes under his care as a practitioner increases his experience and skill if it be dealt with intelligently. Like other practical arts and crafts, treatment has to be learned as work undertaken and done in individual instances. Now

what most impresses the student of the art of treatment is probably the necessity of acquiring dexterity in the use of instruments, and readiness in prescribing medicines, in ordering diet, and in giving counsel, warning or encouragement to patients. Naturally he follows and copies his teacher in these directions. Unless the teacher or master be careful to guide and warn the student of treatment there are certain dangers connected with this method of training. The beginner, fresh from books and lectures, is confident of his knowledge of "the treatment" of each disease. This he has learned as if it consisted of established facts co-equal with the great facts of ætiology, pathological anatomy and clinical medicine, whereas it amounts to nothing more than a collection of temporarily settled opinions. He believes that when he has named the disease before him he has but to order "its treatment" for it. He sees the physician turn from patient to prescription. He hears the surgeon call for a knife after diagnosing an abscess. He naturally concludes that diagnosis is immediately followed by the application of the authoritative method laid down in books on the theory of treatment. He fails to note, and very often is not taught, that a step of vital importance comes between diagnosis and treatment: grasping the indications presented by the particular case before him. If there were nothing more in practice than to follow blindly the authority of writers and lecturers on the Theory of Medicine and Surgery, therapeutics would be a simple art—indeed, unworthy of the name of art.

Personal experience and responsibility quickly undeceive the young practitioner. He finds that the theory of treatment and the practice of it as an art are two very different things. The Practice of Medicine and Surgery is a real art: it means *doing and using that which is best in the particular instance before us*; not copying in a routine and mechanical fashion what has been done in other instances. Routine treatment is bound to fail more or less completely when put to the test of practice, even if based on sound general principles.

Let us consider the principal circumstances which make the practice of Medicine and Surgery an entirely different matter from the theory, and are the occasion of many of the difficulties

which the beginner feels when he is thrown on his own resources for the first time.

Treatment of a disease is not treatment of the patient, that is, of the case or instance of the disease before us. The simple recognition or naming of a disease is not a diagnosis of the case. It is not sufficient to furnish indications. It is not a working diagnosis. Here we discover at the very first an essential weakness of treatment (however rational it may be in appearance) that is founded solely on book-knowledge. There are no two cases of any disease exactly alike—in severity, in stage, in associated conditions of the organs and functions, in the circumstances which surround the patient; and this whether it be a grave disease like pulmonary tuberculosis or a simple disease like eczema or abscess. Each case presents a fresh problem which has to be studied and solved before action is taken. The individual subject is different in each instance; in some respect or other the indications are different, too. No treatment could be laid down previously as entirely correct and suitable in every case, that is, in any particular case. We must "beware of systematising too much; a therapeutic formula which applies to all cases indiscriminately cannot be admitted."[1]

It is obvious that complete diagnosis, that is, diagnosis sufficiently complete to afford grounds for prognosis and treatment, involves a series of enquiries and observations entirely independent of the guidance of systematic descriptions of the disease; and also the exercise of independent judgment in adapting treatment to the result. It may take the beginner years of experience to grasp the significance of this radical difference between the theory and the practice of Medicine, and many more years to learn how to give effect to it in treatment. He may have to deal with many cases of common pulmonary phthisis, for example, before he appreciates fully that the rational treatment of this disease is different according as it occurs in the young or in the old, in the married or the single, in the rich or the poor; according as one or both lungs are involved; the

[1] Dujardin-Beaumetz, "Treatment of Typhoid Fever," *Practitioner,* 1891, vol. xlvi. p. 296.

process active or quiescent; the unaffected parts of the lungs strictly normal or not; the larynx, intestines and kidneys sound or diseased; and so on, including such apparently insignificant differences as the particular profession the patient follows, and the season of the year. We may confess at once that the temptation to omit a great part of this enquiry is often too strong to be resisted. The busy practitioner may have neither the time nor the inclination for this mental exercise. He rests content with simple recognition of the disease—"phthisis," and proceeds to order "treatment for it." Unfortunate results may attend treatment planned in this fashion. The simple naming or labelling of a disease is regarded as practically equivalent to a knowledge of the whole nature of the case. It is supposed to be enough to diagnose "mitral incompetence," perhaps "heart disease," perhaps even "a systolic murmur"!

The same considerations apply to *the significance of the individual symptoms* or phenomena presented by the patient. Having made a diagnosis, for example, typhoid fever, the practitioner is disposed to regard all the clinical phenomena of the case as "symptoms of the disease," and to treat them as such on a uniform system learned from books—for example, the diarrhœa. But a disorder attending a disease may arise in a variety of ways, and be of various significance; and each mode of origin will demand special interpretation and its own proper treatment. Thus the diarrhœa of typhoid fever is very likely caused by improper feeding rather than by the pathological process itself, and its rational treatment involves an intelligent study of the stools and reconsideration of the diet. Here is fresh opportunity and necessity for investigation and judgment on the part of the practitioner independently of all books, and only attention and thoughtfulness will enable him to apply skilful treatment.

Another great difference between theory and practice depends on the *relative importance to be attached to the different parts of the disease.* The condition really calling for relief or remedy in any individual case is often misapprehended. Not the disease itself, say tuberculosis, but some superficial, transient disorder of the digestive tract, may be the source

of distress and the proper object of treatment. Blue pill often proves the most valuable of remedies in phthisis by removing anorexia, indigestion and languor. By experience and by experience only does the physician come to appreciate this important consideration and to give it due weight. He cannot too clearly realise that a large measure of the success which attends practice is due to the fact that in many instances it is not grave pathological conditions, known as valvular disease, Bright's disease, and the like, that call for treatment, but a series of minor disturbances of a functional character which have supervened upon them and which are quite remediable. Much of what is known as "acumen" in one practitioner as compared with another consists in a faculty—a disposition and perhaps a cultivated method—of discovering these casual elements in a case and dealing with them.

In many instances treatment has to be attempted *without a diagnosis of the disease.* The disease has not been identified because of the inherent difficulty of the case; or because urgency forbids attempts at diagnosis, *e.g.* in asphyxia or convulsions; because the nature of the disease may not declare itself for some days, as in typhoid fever; or because the state of the patient forbids physical examination, as in hæmorrhage from the chest. Without a name to the disease it is impossible for the beginner to consult authority. But something must be done. The practitioner has to be guided by the proper use of clinical phenomena and by his own judgment; and has to display readiness, resource, and resolution, based indeed on sound knowledge but on something beyond it and of a higher order as a qualification for the art of treatment. Still more often, cases present themselves in ordinary practice which are nondescript: slight ailments of the digestive and respiratory tracts, complaints of want of mental or bodily vigour, pains, cardiac disturbance and the like, conforming to no disease as it is described in systematic treatises on Medicine and Surgery, but equally demanding attention from the medical attendant. Under these circumstances, that is in a considerable proportion of all the cases which he will be asked to treat, the young therapeutist keenly appreciates what

the art of Medicine is, as distinguished from the theory, and how unskilled he is in it. There is some danger lest in learning to deal with ill-defined illness of this sort he acquire a certain routine readiness in prescribing, to the neglect of investigation.

The relative importance and urgency of the different indications are often difficult to determine. The question always arises what is to be done first, whether because of its radical importance in relation to the origin and nature of the disease, or because of its urgency, that is, in relation to danger and distress. No general rule can be laid down on this point. Sometimes the ætiological, sometimes the pathological, sometimes the clinical indications must be first attended to. In opium poisoning the immediate and instant treatment consists in removal of the cause; in abscess it lies in dealing with the pathological state; in renal colic it lies in neither the one nor the other but in relieving the sufferings and depression of the patient. This step in the treatment, doing the right thing at the right moment, usually appears to be taken instinctively, but it is, or ought to be, the result of the exercise of sound judgment however quickly formed. Beyond this, to give each indication its proper and relative value demands a judicial mind—indeed the judicial mind. However it is to be accounted for, this kind of judgment appears to be a special faculty, a personal gift. In Law, in Art, in public and private business, in the affairs of every-day life, and so in treatment, some men have the faculty of seizing on the essential and the correct, and brushing aside the non- or the less essential. They "go straight to the root of the matter," they "see through it," they "grasp the situation at a glance."

But perhaps the difficulty felt most acutely in learning the art of treatment is in respect of the *progress of the case*. Treatment may have been planned and instituted with comparative ease and success at first; but with the development of the case the problem changes and difficulties increase, just as the situation changes in a battle or in a campaign with every move of the enemy. Increase of the disease, the appearance of complications, failure of remedies, and other

evidences of want of success, disconcert the therapeutist. Theory is but an imperfect guide now; art is everything—to seize on the essential and useful at the right moment. The practitioner is indeed thrown on his own resources. Hard and fast routine is felt to be useless even by the most casual practitioner; the immense value of general principles rather than of specific authority or direction is fully appreciated.

Passing from the difficulties connected with the ends to those connected with the means of treatment, we appreciate still more keenly the great difference between the theory and the practice of medicine. Quite irrespective of the use of instruments, which has to be learned practically, there are many details of the therapeutic art which nothing but experience founded on careful observation and cultivated judgment can teach us. These are connected especially with the employment of non-material remedies. Medicines and food are easily ordered and administered: persuasion, appeal, conviction, encouragement and warning are difficult to employ—for instance in a case of chronic alcoholism. There are endless other ways in which art is required in practice and cannot be learned theoretically. Clinical skill and tact are shown in the adaptation to treatment as the opportunity arises, of time, place and the patient's circumstances; in encouraging and satisfying the patient with the treatment and inspiring him with confidence as the case proceeds; in managing his relatives and friends, and assisting him and them in dealing with the many questions of occupation, work, rest, change, etc., which constantly arise in the course of considerable illnesses, as well as in his more delicate relations with his spiritual and legal advisers; even in prescribing elegantly, instead of ordering nauseous or otherwise objectionable remedies; and, if all else fail and hope be ended, in practising euthanasia.

It thus appears that from one cause or other the task of the young therapeutist is beset with practical difficulties when he loses the authoritative guidance of his teachers. *He is now in a position to appreciate the value of sound principles*, and

of judgment cultivated by observation and experience, that is, by careful self-training.

Order of Therapeutic Procedure.

It is impossible to lay down strict lines on which the practitioner should proceed when he finds himself cast on his own resources, so infinite is the diversity of cases presenting themselves for treatment. Still there are a few rules relating to therapeutic procedure which he might profitably bear in mind, and which had best be formulated categorically.

Commencement of the Case. — Never approach the treatment of a patient without making a genuine effort to diagnose the pathological condition with which you have to deal, as distinguished from the mere recognition of symptoms. Even in the presence of urgent danger (from hæmorrhage for example) let your treatment be regulated by this consideration as far as possible; in cases devoid of urgency spare no pains to employ every fact for the purpose of diagnosis, and on this found your treatment.

Make a complete diagnosis of the case as distinguished from the disease: be prepared to treat *the patient*.

I. *If the diagnosis have been reached*, proceed as follows:—

1. Consider *the course* which the case may be expected to follow, and the complications and sequelæ which may arise.

2. Next review as deliberately and methodically as possible *the indications* furnished by the ætiological, pathological, and clinical facts of the case as far as they are known.

3. Consider *the order* in which the different indications are to be attended to, according to their absolute and relative importance respectively.

4. *Let well alone.* This is one of the most important indications of a negative kind which can be drawn from a study of the natural history of disease in general. Do not interfere unless interference be definitely called for. Routine treatment for the sake of "doing something" is wrong. It is easy to do harm by uncalled for intervention. When the natural provisions for resistance or recovery are sufficient, as evidenced by the insignificance of the cause, the mildness of

the symptoms, and the favourable progress of the disease. treatment is meddlesome and likely to prove mischievous. It disturbs the natural course of disease, confuses the diagnosis, and deprives the medical attendant of valuable materials for judging of the progress of the case, for reaching a prognosis, and for indicating treatment when it comes to be really required, as may happen later. Unnecessary treatment is often positively harmful. It sets up disorders within the body which are interpreted to be fresh evidence of the original disease and to call for further treatment. The management of a case which originally was doing perfectly well without treatment may easily drift in this fashion from bad to worse. It is also necessary to remember that a person who is unsound may be perfectly healthy and require no treatment. A case of compensated mitral stenosis ought not to be interfered with simply because a murmur happens to be discovered; and if giddiness or palpitation occur, it probably calls for a dose of Epsom salts or reform of diet, not for digitalis or rest. In the skilful management of "surface troubles" supervening upon unsound conditions of the viscera, as we have seen already, the Art of Medicine wins and indeed deserves repute; that is, in doing little (but still enough) where routine treatment would be excessive and unsound. As for the practitioner himself, and Medicine as a science, unnecessary treatment fosters an exaggerated, possibly an entirely false, estimate of the action and value of drugs. From a professional point of view, meddlesome interference may readily prove demoralising. At the same time it is not always easy to leave a case to spontaneous recovery. It takes a wise man to know when to hold his hand; and in treatment it is certainly a more severe test of judgment to deliberately do nothing than to do much. And the practitioner may be driven to interfere by the sentiments of the patient or more often of the patient's friends. "Masterly inactivity" might beget want of confidence, an unfortunate and unfavourable position for the practitioner to occupy. The sensitive attendant, too, may be haunted by a want of confidence in his diagnosis and by an over-mastering sense of responsibility. He "fears he may have missed something,"

and he "wants to give the patient every chance." This is natural, but it is an evidence of lack of self-confidence and resolution, two essential qualities in the mental equipment of the practitioner. On the whole, young practitioners are disposed to interfere too much and too often; to be over-diligent; to have too much faith in their remedies. After studying grave cases in hospitals, they are not prepared for the considerable class of patients—women mostly—who have no real structural disease, and they fail at first to understand and to manage them. These patients fear "a young doctor," and with good reason. They are seriously treated with physic, and may be seriously upset.

5. When treatment can be deliberately planned, *i.e.*, excepting in cases of emergency, *remedies are to be ordered methodically*:—

a. Begin with directions for *the general management* of the case: whether treatment is to be conducted in bed, at home, or without interruption of ordinary occupation. Never forget ordinary or everyday means of treating disease—exercise, sleep, baths, clothing, ventilation, nervous influences and the like. Do not miss the help or let slip the control of these invaluable remedies whilst ordering bottles of physic, liniments and blisters. Emergency however may compel disregard of these considerations: it involves instant action.

b. Next order *the diet.* Food is to be considered before drugs. Food is always one of the means employed; medicines are often unnecessary. Alcohol and tobacco should also be referred to.

c. In many cases *non-medicinal remedies* are to be planned next: surgical measures, local rest, electricity, massage, movements, lavage, enemata, spectacles, etc.

d. Medicines are ordered, the actions of which are known pharmacologically or therapeutically. Drugs are combined, in order to fulfil the different indications; and prescribed in different forms (pills, mixtures, enemata, lotions, etc.) according to the subject, the seat of the disease, the rapidity with which their action is desired, etc.

II. *If the diagnosis have not been reached,* proceed as follows:—

1. When the facts warrant only an *alternative diagnosis*, let it be a rule of practice to employ a line of treatment which, while calculated to benefit one or other or more than one, particularly the gravest, of the morbid processes that may possibly be present, will aggravate neither. This is often our position in apoplexy, for example; cerebral hæmorrhage calling for lowering measures, thrombosis for stimulation.[1] In severe sore throat of doubtful nature, but possibly diphtheritic, we use antitoxin which may be invaluable if employed without delay and cannot possibly do harm. When called to a man suffering from hæmoptysis we may be unable to reach more than an alternative diagnosis; the bleeding may be a symptom either of mitral disease, of pulmonary tuberculosis, or of aortic aneurysm. Physical examination of the chest is not permissible. We abstain from ordering specific treatment directed either to the heart or to the lungs. We prescribe a hypodermic injection of morphine, absolute bodily rest, and restricted diet, all of which are calculated to be of use, none of them objectionable, whether the blood proceed from an engorged area of the pulmonary capillaries, from a broken branch of the pulmonary artery, or from a leaking aneurysm.

2. When facts do not justify *any* diagnosis, several courses are open:

a. Expectant treatment. Wait and watch. If we are at a loss what to do, if we cannot be sure of doing good, let us see that we do no harm. Let well alone; being prepared to act the moment an opportunity occurs. If there appear to be nothing likely to be gained by action, a man should be honest enough to confess his ignorance—to himself, and attempt nothing. But in practice we have already seen that expectant treatment, so-called, is not a passive attitude. On the contrary, it may involve abundance of work—mainly attention to symptomatic indications: the relief of distress, the removal of disorder, feeding, stimulation, etc. Care must be taken, however, not to interfere in a meddling way with phenomena of the disease, such as pyrexia, which are likely to prove of diagnostic importance.

[1] Gowers, Quain's "Dictionary of Medicine," art. "Apoplexy, Cerebral," vol. i. p. 104; cf. Brudenell Carter, *ibid.*, art. "Eye, etc., Diseases of," p. 661.

b. Experiment. Try certain safe measures which may be of service, and if so will assist the diagnosis at the same time. Mercury, iodide of potassium and quinine, for example, are often given in doubtful cases with the double result of being remedial and diagnostic. Salicylates may serve to reduce fever and at the same time to effect the diagnosis of its significance—rheumatism.

c. Attention to the individual indications furnished by the facts of the case, considered separately, since their mutual and collective bearing cannot be ascertained. In this we must interpret, as far as possible, the ætiological, pathological or clinical significance of each fact. When we fail to discover whether acute arthritis be gouty, rheumatic, or gonorrhœal, we follow the indication furnished by the pain and swelling, and set the joint at rest. It is correct to tap the chest when it is the seat of a large effusion whether it be inflammatory or dropsical. A considerable part of practice falls under this head.

d. If we are ignorant of the significance of even the clinical phenomena of a disease, both as a whole and individually, they are *to be regarded as symptoms and signs of physiological disturbance* (the nature of which remains to be ascertained), and as furnishing for the present symptomatic indications, for instance glycosuria.

3. Remember that *to temporise is not to treat the disease*, even if relief have been afforded. Grave mischief is often done by resting satisfied with attention to individual symptoms, by expectancy, and especially by masking symptoms—by concluding that because a patient is comfortable he is doing well. More probably the precious time for decisive action is lost. Therefore relax no effort in the meantime to complete the diagnosis of the case at the earliest possible moment and to institute more fundamental treatment based on ætiological and pathological considerations. After a few days' observation headache proves to be a manifestation of syphilis, indicating mercury; or it turns out to be a symptom of Bright's disease, in which case anodyne drugs might be positively dangerous. The treatment of convulsions is a matter of urgency, but it is a question of extreme importance whether they are a manifestation of Bright's disease or of cerebral

tumour. Equally desirable is it to ascertain at the earliest possible moment whether hæmatemesis which we have to treat without a complete diagnosis proceed from active gastric ulcer or from portal congestion; whether hæmoptysis in phthisis be referable to rupture of an artery in a cavity or to active hyperæmia around fresh tuberculous growth; whether delirium be an effect of poisoning by alcohol or by belladonna, or a symptom of meningitis or of uræmia.

Progress of the Case.—It is usually more difficult to conduct the treatment as the case progresses than to order it at the commencement of the illness: more difficult to continue than to start. Routine methods are ready at hand the moment the diagnosis is reached, for instance in syphilis and typhoid fever; difficulties begin to be felt as the different phases develop. Progress is ascertained by the familiar inquiry, "How is he getting on?" or "How is he to-day?" by the regular examination of the patient's state—his posture, expression, pulse, tongue, temperature etc., and by perusal of the nurse's record. We say that he is better or worse, or that there is no change. Progress is therefore one of the practitioner's chief guides; indeed it furnishes the test of treatment as well as one of the series of indications for it. The simple fact of improvement or the reverse, whatever the cause of the change may be, influences treatment. Improvement suggests the inquiry, "Need the treatment be continued?" On the other hand, if the patient be worse, we anxiously ask ourselves, "Are we on the right line?" and "Must not the treatment be reconsidered?" In acute disease these are anxious, possibly momentous, inquiries. They severely tax the confidence of the young practitioner, and they test the character of all of us for judgment and self-reliance.

Before we attempt to formulate the therapeutic principles on which a case of illness is to be conducted from hour to hour, and from day to day, we have to discuss certain considerations connected with its progress, particularly *the chief events in it which may be turned to account as guides to treatment.*

Every considerable change in the patient's condition, whether for better or for worse, must be faithfully observed as it arises, and its significance studied. The meaning of each

event and every new fact must be carefully weighed before we arrive at the resolution to continue as before, on the one hand, or to plan, on the other hand, a fresh departure or a modification of the original scheme.

The results of treatment, whether successful or unsuccessful, are to be added to the natural history of the case, that is, to the material from which further or more accurate indications can be drawn. The correctness of diagnosis and the soundness of treatment can often be tested by the effects of the administration of drugs of unquestionable action. In this way, the use of iodide of potassium confirms or disproves a diagnosis of syphilis, and the observation guides our proceedings as the case progresses. Quinine sometimes reveals a malarial taint in a patient which ordinary clinical inquiry had missed, and suggests an ætiological indication which is at once accepted and fulfilled. A few doses of bicarbonate of potassium have been known to disclose the gouty nature of a violent headache that had baffled the resources of an experienced practitioner for weeks, simplifying at once the whole future treatment of the case.

Great caution must be exercised, however, in referring changes that occur in the progress of a case to the treatment employed. It is necessary to insist on this point for various reasons, some of which may be briefly discussed.

There is a strong disposition on the part of the patient and his friends to attribute every change, whether improvement or the reverse, to the medicinal remedies that have been administered. Nor is the practitioner himself by any means always unprejudiced. As a rule he is ready to credit his treatment with whatever improvement may occur. *Post hoc sed non propter hoc* is a hackneyed aphorism in treatment, but one which is often disregarded. Popular faith in drugs is still unreasonably strong; but the modern practitioner ought to have no difficulty in disabusing his own mind, if not the minds of his patients, of erroneous conclusions in this direction. It is unnecessary to repeat that many of the "cures" on which practitioners once prided themselves were spontaneous, that is, occurred quite independently of treatment, possibly in spite of it. Even when we deserve credit for a successful

result, it is by no means always the particular measure which we esteem so highly that has brought relief. In an urgent case of cardiac dropsy in a poor man it may not be the digitalis that has induced free diuresis, but the rest, warmth, and general comfort which the hospital afforded him at the same time. In many instances of this character, as we have already seen, we never reach the disease itself with our medicinal remedies; we only remove some supervening cause, such as exertion or privation or alcoholism, which is accountable for the urgent symptoms. Still if the progress of a case be unfavourable, we must be prepared to inquire how far our line of treatment is accountable for the result. Treatment, especially by drugs, is sometimes blamed undeservedly, as we have already seen and as we shall see again presently, but in many instances the charge is well founded. This is not a matter of sentiment, but of urgent practical importance. There is danger in blindness to the harmful effects of treatment, particularly of treatment by drugs. Whilst a remedy has fulfilled satisfactorily the indication for which it was ordered, it may have done positive harm otherwise. Opium is the drug most abused in this way. We are satisfied with the relief which it affords from pain, cough, or insomnia; we blind ourselves to the unpleasant fact that this result has been purchased at the cost of deranged digestion, arrest of hepatic and intestinal action, cessation of useful expectoration, and other evils immediate and remote, possibly even the morphine habit. Chronic alcoholism not infrequently originates in the casual recommendation of brandy by the medical attendant for some insignificant complaint.

Beyond this there lies a liability to error of an equally serious but more complex and obscure kind. In our blindness and self-confidence, we fail to observe that a new symptom which has made its appearance during the progress of a case is due to a drug which we have prescribed. A fresh drug is given to meet the fresh symptom. This drug in its turn sets up disturbances, which again are attributed to the original disease, not to our own mismanagement. Thus we flounder on, treating symptom after symptom all of our own making, and led farther and farther away as if by an *ignis fatuus* from

the primary malady and the proper line of treatment. For instance, an aged lady suffering from gouty bronchitis is dosed with paregoric elixir. The urine becomes thick, scanty and acid, and the bladder irritable. Hyoscyamus is prescribed for the "cystitis." Delirium follows. A double dose of hyoscyamus is ordered as a sedative. With difficulty the patient is rescued from death by complete cessation of all drugging—a simple-looking remedy but a strictly rational one, founded on the diagnosis that the patient has been nearly poisoned with two powerful drugs, the effects of which the practitioner had been crediting to the disease. In this instance the significance of several valuable observations had been missed in connexion with the effects of treatment: first, that a small dose of opium powerfully depressed the functions of the liver and kidneys—a very significant fact; second, that a moderate dose of hyoscyamus also produced toxic effects—a strong confirmation of the meaning of the first event, namely, inadequacy of the renal functions. How much better for the patient, some would say, had there been no drug to give at all. How much better, let us say instead, had correct interpretation of a series of valuable clinical facts brought the truth fully before the practitioner's mind.

Broad rules for the management of a case of disease during its progress which may be based on the preceding considerations will now be formulated.

1. *The line of treatment which was adopted at the commencement*, being the outcome of all the knowledge possessed by the practitioner, *must be adhered to for a sufficient length of time to test it fairly.* It must not be immediately and repeatedly altered if it fail (or appear to fail) to be successful. Vacillation is one of the worst of weaknesses in a practitioner. It is to be classed with indecision, hesitation, irresolution, which let slip many a golden opportunity. The advantages of consistent adherence to a definite plan or line of treatment are many, direct and indirect; to the patient first and also to the practitioner. In the first place, it gives the treatment a chance. Without time no treatment can be expected to succeed. A fact which is too often for-

gotten is that some drugs, even drugs of great power, take a considerable time to make their action felt, for example, digitalis, mercury and arsenic. Secondly, it compels attention to the result of the method employed. It is only in this way that the recuperative powers of the patient can be determined. It is only in this way that the method, and the practitioner's acquaintance with diagnosis and with practical treatment, can be tested. *Probiren geht über studiren.* Thirdly, the resolution to adhere to a plan compels the *making of a plan*, which in its turn compels a careful diagnosis—a diagnosis not in name only but a working diagnosis. Lastly, it prevents the miserable make-believe "treatment" which consists in nothing more than meeting each symptom individually as it arises.

2. *If the case be doing well* on the treatment employed, the indication is to continue this until fresh indications arise, in consequence either of a change of diagnosis, relapse, complication, decided improvement or the reverse. It is a golden rule in practice to let well alone. We have already said enough in support of this self-evident principle. It is only necessary to add here the further argument in its favour that if improvement have commenced and be increasing under a rational line of treatment, the indications and the diagnosis on which they were built are most probably correct. To have established these facts will greatly facilitate and strengthen further action.

3. *If the case still continue to progress favourably*, treatment is to be changed in accordance with the new indications, such as the termination of a febrile process, the healing of a wound, the disappearance of fluid from the pleural cavity, the restoration of compensation, the advent of convalescence. Such changes should be deliberate and gradual: not made casually but for specific reasons. Salicylates are slowly reduced in acute rheumatism; solids are cautiously admitted to the diet, and stimulants cut off, at the end of typhoid fever; the strict regimen is jealously relaxed in diabetes mellitus even when sugar has disappeared; the successive forward movements of sitting up in bed, rising for an hour, walking round the room and going out in convalescence

from acute disease have to be permitted with due caution, step by step.

4. *If the case do not improve* on the treatment employed after a reasonable trial, as already discussed, *a change of treatment* is indicated. Apart from incurable disease, the question that arises under these circumstances is: What better, what other, can be done? To be convinced of the necessity for change is one thing; to know what to do next is another. We should first of all try to account for our want of success. Now, the most frequent cause of failure of treatment, beyond incurability of the disease, is probably *incorrect or incomplete diagnosis.* The diagnosis must therefore be first reconsidered. If it prove to be correct, the *indications* will next have to be revised—as a whole, in respect of the relative importance and urgency of the different indications, and as regards those of them which can be most easily fulfilled to begin with. Thus, if we have been treating without success a case of cavity at the base of the lung by means of intralaryngeal injections, we reconsider our diagnosis and we find it correct. We revise our indications and adhere to the desirability of evacuation and disinfection; but we determine to observe more fully than before the equally important principle of promoting healing by attention to the general health, and for this purpose to stop the injections which have interfered with the appetite and general comfort of the patient. In another very large number of instances the *means employed* to fulfil the indications have proved insufficient or incorrect—in kind, in dose, in form, in frequency, or in combination. Many minor changes in this direction can be made; and not infrequently with success. It is almost unnecessary to repeat that under these circumstances the very fact and the details of the failure of the first attempt at treatment may often be turned to good account in amending or amplifying the diagnosis and indications and in suggesting fresh remedies. Unsuccessful treatment properly interpreted is a valuable means of observation. It has been wisely said that every exception to a law is an evidence of the existence of another law still undiscovered. But we must also remember that, if we are to take full advantage of this

consideration, we must be careful *not to make the change of treatment too extensive.* The change is to be definite and complete as far as it goes, but only in one direction at a time. For instance, a case of subacute nephritis does not benefit by a course of several weeks' treatment with rest and warmth in bed, rigid milk diet, saline diuretics and iron. In making a change, we begin by altering only one of these measures, the diet, meat and vegetables replacing the milk. Whether we are now successful or whether we are not, we shall at least have determined in a week by following this plan the influence of diet as an element of the treatment.

5. In connexion with the progress of a case, let it be a cardinal principle of treatment to make an effort to *interrupt vicious circles.* In a complex organisation like the body, the smallest help afforded at the right time, the briefest arrest in the downward course which disease is disposed to pursue, may break the continuity of the destructive factor of the process, prevent or relieve suffering, arrest or remove complications, shorten the duration of the case, and favour completeness of recovery. The great point is to *make a beginning.* Treatment often consists in opportunely throwing a weight into Nature's scale, after which she may be left to right herself. It is not necessary for treatment to do everything that has to be done: only, perhaps, to start spontaneous recovery on the right line, to relieve the diseased part of arrears of work which hamper it. We puncture the abdomen or the legs in cardiac dropsy, but not to drain the last drop of fluid away. As each ounce of serum flows, the heart and kidneys are gradually relieved, and circulation, digestion, absorption and elimination recover vigour, and come to the help of the embarrassed heart. For the same reason it is of special importance in the treatment of all classes of cases to remove accumulated disorders of the *primæ viæ;* and so it is a leading indication in the treatment of disease generally to be careful to avoid disturbing the digestive and nutritive systems when making attempts at local or specific therapeutics. The force of another fundamental principle of practical treatment is best appreciated in this connexion. The interdependence of all the bodily organs, on which the formation of vicious circles

depends, must never be forgotten: in other words, the state of the body as a whole, which implies the state of every individual organ, must always be estimated. "The most judicious medical men are those who will take the body as a whole, the good and bad, observe all the different functions, and so, by simple methods, rule and guide the whole bodily organism as to bring it to a proper adjustment."[1]

6. *Avoid excessive length of treatment.* Let the duration of treatment be as much as is needed and nothing more. Treatment must never be unnecessarily prolonged. A disposition to interfere incessantly with disease when its progress is satisfactory, and to persist in treatment after recovery is fairly established, is a mark of ignorance of the first principles of therapeutics. The limited course and the favourable tendency of many diseases are often disregarded.

7. As disease approaches a successful termination it may be wise to *be content with a moderate result.* The attempt to secure complete recovery in every instance may be more than unsuccessful: sometimes it proves harmful. Repair and recovery are, after all, very often only the best that can be done under the circumstances, as we have already seen. In the successful treatment of a case of diabetes mellitus, it may do more harm than good to attempt to remove with drugs the last few grains of sugar.

[1] Wilks *Med. Press and Circ.*, London, 1885, vol. ii. p. 117.

PART II

ILLUSTRATIONS OF THE PRINCIPLES OF TREATMENT

CHAPTER X.

ACUTE INFLAMMATION OF THE HEART.

Acute Endocarditis.

The treatment of acute endocarditis affords the young practitioner an exceptionally favourable opportunity of studying and applying the principles of rational therapeutics. Its ætiological relations are obvious, and its chief cause—acute rheumatism—can be successfully attacked with a specific remedy. The pathological process of acute inflammation of the endocardium is readily intelligible, particularly as regards its distribution or location, its tendency to spread in area and in depth and the circumstances which favour this, the disposition of the reparative process to end in permanent valvular lesion, and the development of compensatory enlargement of the heart. Whilst the physical signs keep the practitioner informed of these pathological changes in the valves and myocardium, the prominent clinical features are those of the primary disease, and a remarkable disposition to other complications and to temporary improvements alternating with recrudescences and relapses. The intelligent management of these relations of acute disease of the heart demands from the practitioner the display of many valuable clinical qualities, particularly foresight, watchfulness, accuracy and strictness in the details of the measures employed, consistency with the method which has been rationally adopted, and continuity and completeness in the course of treatment. Nor can these qualities be remitted during convalescence which (as well as the compensation often attending it) is imperilled by persistent liability to return of rheumatism and fresh endocarditis. In a word, the

gravity of endocarditis is found to lie, not in its being a disease that causes distress or immediately threatens life, but in the great liability of it to end in chronic valvular disease. This feature of the disease has to be kept clearly and continuously before the mind from the beginning.

Ætiological Indications.—Acute endocarditis illustrates in a very complete and instructive manner the value to the therapeutist of a correct appreciation of the three orders of causes of disease which we studied in Part I. In the first place, the chief ætiological indication derived from such knowledge as we possess of its efficient causes is to deal with them directly; and the specific means of doing so are practically the same as those for the prevention and treatment of acute rheumatism,[1] namely the salicyl compounds. The second set of influences at work in the causation of this disease are the predisposing. The part played by predisposition in endocarditis is very marked. The vulnerability of the endocardium of the young heart suggests to us that the greatest possible care should be exercised in rheumatic children. Even more striking is the fact that it is the endocardium covering the valves, more particularly those of the left side of the heart, that offers least resistance to infection—in other words, the parts which are specially in a state of movement and mutual percussion. It is clear that if endocarditis is to be prevented these vulnerable parts cannot be protected one moment too soon in rheumatism, and that this end will be best effected by means of rest. Ignorance or disregard of this consideration affords an opportunity for the incidence of the determining circumstances of acute inflammation of the heart, which are chiefly exertion and excitement. We believe that some of the worst cases of valvular disease of the heart, particularly mitral stenosis, originate in persons (children) who have had latent endocarditis and been permitted to move about freely during its course. Therefore in articular rheumatism however slight, in all acute illnesses

[1] In a small proportion of instances endocarditis is secondary to acute specific processes of other kinds, such as scarlet fever and septicæmia; but the principles of treating it will be most conveniently discussed as it is met with when a phase of rheumatism.

which may possibly be of rheumatic origin such as tonsillitis, erythema, pericarditis and pleurisy, as well as in chorea, the danger of involvement of the cardiac valves should be reckoned with, and not only specific means but bodily and mental rest employed, and employed as early and fully as possible, to prevent it.

If the attempt to prevent endocarditis fail, the indications remain in force—to try to remedy it by destroying the specific cause of the rheumatic valvulitis with specific means, and by reducing the strain on the heart. Invasion of the heart is no reason for abandoning the use of salicylates, but the contrary. A belief is widely prevalent that because salicylates are "depressing to the heart" the appearance of cardiac disease ought to be a signal for their interruption. The very opposite is the case. Our chief hope of arresting the endocarditis lies in directly assailing its cause; and of two cardiac poisons, the salicyls and the rheumatic poison (whatever it may be), the latter is infinitely the worse, whilst the former may be combined with digitalis and ammonia. We shall return to this point presently.

Pathological Indications. — The first question that naturally arises in connexion with the pathological characters of acute endocarditis relates to arrest of the destructive factor of the inflammation and control of the circulatory reaction in the tissues of the valves. It must be acknowledged that apart from the salicylates we possess no direct means of accomplishing either of these ends. Neither bleeding, leeching, cupping, blistering nor the use of mercury is any longer employed in simple endocarditis. But if we are powerless in this respect, there are several indirect ways in which we can fulfil the same indications. The favourite seats of endocarditis prove, as we have seen, to be the valves of the left ventricle and other parts specially subjected to stress and impact. The evil effects of unrest are plainly demonstrated. The indication here is to save the valves: by reducing the force and frequency of valvular percussion, by lessening the work thrown on them in each cardiac revolution, and by quieting the muscular and nervous irritability of the heart. The fact that valvular disease is practically confined to the mitral

and aortic valves plainly suggests to us that if we could safely reduce the force of the left ventricle to that of the right, the lesions might be entirely prevented. The application of the great principle of rest is of prime importance in the prevention and treatment of endocarditis. In the adult bodily rest has been already effected by the rheumatism; and the relief of pain and pyrexia speedily obtained by the salicylates insures mental calm and promotes sleep. The chief danger is in children, who suffer little with their joints and who are frequently permitted to sit or even to walk about with latent arthritis and active endocarditis.

Our next concern in rheumatic endocarditis is with repair. There is plenty of evidence that resolution may occur in inflamed valves. Vegetations may disappear and leave behind them but slight traces of their existence. Far more often, unfortunately, resolution is incomplete; the softened valves are stretched by the intracardiac pressure; or repair is excessive, and disabling. Either way the result is chronic valvular disease, in the form of stiffness, irregularity or unnatural adhesion of the segments, or stenosis of the openings, with incompetence or obstruction of the valvular mechanism. The indication is clear—to secure complete resolution of the inflammation. Just as we try to limit the extent and degree of damage by preventing contusion of the valves, so we have to control repair by checking immoderate growth of vegetations and by accelerating their disappearance. In this way we may hope to obtain what a surgeon would call successful repair of the valves, or a good cicatrix, free from irregularity, mal-apposition and deformity. We know (p. 67) that to effect these ends repair will have to begin early, to proceed rapidly, but at the same time to be thorough, that is, the conditions favourable to it will have to be maintained for a sufficient length of time. Therefore in rheumatic endocarditis we not only order salicylates and rest, but we order them at once and in full amount, and we continue them for a considerable period after the associated synovitis has disappeared. It is doubtful whether we possess drugs which promote absorption of inflammatory material in and on the valves. The particular lesion that there is least hope of

influencing in this respect is infiltration of the structures at the left auriculo-ventricular opening which shows an unfortunate disposition to end in progressive stricture, constituting mitral stenosis.

When we bring together the previous considerations relating to the destructive and reparative factors of acute endocarditis, we find that the leading pathological indication for treatment is to promote rest. Now rest of the heart can only be relative. It cannot be made absolute, for the circulation must be carried on. It is also rest of quite a special kind, inasmuch as it occurs at rhythmically recurring intervals, in diastole. How rest is to be secured under these circumstances will be best discussed in our study of the clinical indications. We shall then be able to appreciate how many influences there are that may disturb the heart, and how extensive in its bearings and how valuable this elementary indication is. For the present it is sufficient if we clearly understand the existence and prime nature of the pathological guide.

Clinical Indications.—Acute endocarditis affords us an excellent opportunity of illustrating the correct employment of clinical phenomena as guides to treatment. In this disease they consist almost exclusively of physical signs; and the student should pause here and ask himself what this term means. It means that certain murmurs which he hears, and the associated observations which he makes in connexion with the heart, pulse, and circulation as a whole, are *signa* or significant of pathological states. In themselves they are but phenomena; when translated into pathological terms they are pregnant with information and instruction. An apical systolic murmur developed under the student's observation brings before his mind the mitral valve, swollen, covered with fresh vegetations, and tightened and bruised by each contraction of the ventricle. This morbid condition, not the murmur, calls for and indicates treatment—and obviously for the treatment which we have just studied under the last head. But whilst no one would propose to treat the murmur, many appear to forget that what applies to the murmur and other physical signs applies equally to the palpitation, præcordial pain and

other symptoms which are also present in acute endocarditis. A clinical symptom is only a phenomenon of another order, significant of a pathological condition or a functional disturbance, and it should be intelligently employed as a guide to treatment in a precisely similar way to a physical sign. In simple endocarditis the symptoms are few and of small account or they are covered by those of the "primary" disease; and the practitioner is seldom distracted by them from attention to the more radical indications which we have just studied. But in the more severe type of the disease associated with the specific fevers the myocardium becomes involved, and there are then definite symptoms to direct our attention to the heart, including pain, dyspnœa, lividity and præcordial distress generally. These, when they do occur, are evidences of cardiac failure, and call for measures to relieve and sustain the heart, and also quite properly for palliative treatment, including the free use of ether, digitalis, ammonia, alcohol and strychnine, and even venesection, leeching or cupping (p. 304).

We may next profitably study how some of the more important indications which we have discovered can be fulfilled, respectively, by feeding, rest, and control of the nervous influences that reach the patient in rheumatic endocarditis.

The *feeding* in rheumatic endocarditis is one of the matters of chief concern. The diet must be fluid, unstimulating and distinctly moderate in amount: and it must be strictly controlled for some time after the rheumatism appears to have left the patient and the appetite has returned. Tested by experience, no clinical indication could be clearer than this, for if solid food be allowed, or prematurely resumed, the rheumatism does not yield or it relapses, as the case may be. We have constantly to resist the appeal of the patient and friends for something more substantial than milk and beef tea. The patient's hungry eyes meet us on our visit after the temperature has fallen and the pains have disappeared, follow us during the examination, and crave for food. Return to solids at this time proves to be one of the chief causes of recrudescence or relapse of the rheumatic process, with fresh danger to the heart. Faithful attention to elimination must be associated with careful feeding: and for the same

reason. Whatever view may be taken of the relation of the rheumatic poison to accumulation or retention of certain excrementitious elements in the blood and tissues, clinical experience is here unquestionable in its indications. Constipation is a definite factor in relapse; the appearance of urates and fall of volume of the urine may be expected to herald fresh rheumatism. Dryness of the skin is a symptom of serious moment. The output as well as the intake must therefore be faithfully regulated. Besides all this, the heart itself is always found to be benefited by the evacuation of the bowels, and by a free flow of urine which promotes the removal of excrementitious products from the system.

The clinical indications for physical and physiological *rest* in acute endocarditis are as clear as those which we discovered by a study of the ætiological and pathological characters of the disease. Physical exertion of any kind in active heart disease is found to raise the force and frequency of the pulse, to induce palpitation, pain, dyspnœa and cardiac distress; and either to increase the loudness of a previous murmur or actually to bring out a murmur where none could be heard in quiet recumbency.

In the management of acute disease of the heart an unusual amount of attention has to be paid to *nervous influences*. Even more disturbing to the heart than rheumatic pain are the depressing emotions—anxiety, fear and dread of impending death or of the ultimate results of valvular damage, particularly in persons who have had previous experience of rheumatic heart disease. Distress often becomes urgent, accompanied with restlessness, palpitation and great frequency of the pulse; and the condition as a whole is most unfavourable and discouraging to us in our effort to save the valves from permanent lesion. Therefore salicylates would be indicated in rheumatic endocarditis, even if they were not specific, inasmuch as they reduce pain and fever. The condition of nervous perturbation is further unhappy in that it may be excited by other than emotional causes, particularly flatulence; that it is worse in the night, disturbing sleep which is so urgently required by the patient; and that it tends to go from bad to worse unless confidence be restored. Of great importance in estimating the

significance of this set of symptoms is an acquaintance with the *personal element* or temperament of the patient. Excitement at a later stage of the disease, as the period of convalescence approaches, when the appetite returns and with it the desire for movement and mental occupation, is scarcely less unsafe. Such excitement may be caused by the visits of friends or the enjoyment of a pleasant book, by disappointment in indulgences of different kinds, or by an incautiously expressed opinion as to the future. When the practitioner appreciates the effects of these nervous influences and of others that will occur to him, he will understand the urgent indication for their control.

Indications from the Course.—The most important of all the clinical indications connected with acute rheumatic inflammation of the heart are those which are furnished by its course, duration, progress, and terminations. When he undertakes the treatment of a case of endocarditis the practitioner must place before his mind a clear picture of the protracted and devious course which the rheumatic process may follow, particularly in the young subject. He has to deal with an acute disease, but one which is indefinite in its duration; which is prone to involve the heart more and more seriously the longer it continues; which is remarkably liable to relapses, followed by slow convalescence characterised by debility, anæmia, and possibly recurrence even then of the rheumatism: and which often ends in chronic valvular disease. It need hardly be said that the leading indications here are to shorten the duration of the disease, and to control its course generally. We must attend therefore with more than ordinary care to the indications which present themselves in every acute febrile disease. Treatment must be prompt; for it is in immediate action that we shall have the best—perhaps the only—hope of controlling the valvulitis, and certainly of preventing its extension. The line of treatment must be clearly planned and strictly followed: and for the same reason treatment must be consistent, continuous and thorough, the great leading principles being closely and persistently adhered to, in spite both of disturbing complications and of delusive improvements.

In rheumatic endocarditis these indications are fulfilled at the *invasion* by putting the patient without delay under the influence of salicylates, insuring rest of body and mind, and attending strictly to feeding and elimination, as already sketched. The state of the joints, the temperature, tongue, skin, and general appearance of the patient, the pulse and the cardiac signs will serve to inform us how long the plan of treatment is to be followed. When pains and fever have been absent for a few days, the dose of salicylates is reduced in size or in frequency; and if all go well, they are gradually but very slowly withdrawn. During this time bodily and nervous rest and our control of food and elimination are as strictly enforced as before, for with the removal of the specific remedy comes danger of relapse. Indeed, as the case progresses, the guiding clinical features to be kept before the mind are the possibility of deceptive improvement, particularly in the subjective condition of the patient, and the liability to *relapse*, that is, to develop fresh manifestations of rheumatism in the joints, heart, or elsewhere. Under these circumstances the correct principle of treatment would be immediate return and close adherence to the plan laid down at the commencement of the illness in all its details. Experience teaches us, if it be honestly interpreted, that relapse is commonly a direct consequence of premature relaxation of our method, or (to speak plainly) of injudicious treatment. Neglect of the bowels, return to solid food, indifference to the effect of the nervous influences to which our patient is exposed, premature abandonment of specific remedies—one or other of these may permit a relapse of rheumatism and with it fresh cardiac troubles. On the contrary, the success which attends the somewhat severe methods here recommended will soon convince us of their soundness. Unfortunately rheumatism may relapse again and again, particularly in children. The skill and courage of the practitioner as well as the physical and moral strength of the patient are then severely taxed. Few therapeutical problems of the kind are more difficult than the management of persistently relapsing rheumatism with disease of the heart in a child extending over a period of several months.

Of the *complications* which have to be reckoned with in

the treatment of acute endocarditis the chief are direct results of the specific process and the severe measures employed to control it. The patient rapidly becomes anæmic, debilitated and wasted. It requires a firm conviction on the part of the practitioner that his system is sound to be able to withhold the solid food and stimulants which are now urgently suggested by the patient's appearance as well as by his cravings and the advice of his friends.

The immediate *termination* of acute rheumatic endocarditis is with very few exceptions recovery; the ultimate termination is in many instances valvular disease of the heart. This unfortunate result has had to be kept prominently before our minds from the first; and as convalescence approaches we have not only to provide for restoration of the blood, body-weight and vigour generally, as we do after acute disease of every kind, but to work for prevention of permanent valvular disease. Our chief efforts must still be directed to relieve the valves of strain. Specific treatment is now to be stopped, and restorative treatment cautiously substituted in the form of simple tonics and hæmatinics. Cardiac rest must still be insisted on, but the severity of the restrictions in this direction may be very gradually relaxed.

The period of *convalescence* from acute inflammation of the heart is always a time of anxiety to the medical attendant, and calls for more attention than it usually receives. It is slow; it is attended with marked anæmia; it may be interrupted by relapses of rheumatism; and it cannot be properly regarded as completed until the valvulitis has been repaired or any valvular lesion that may have been left has been compensated by enlargement of the heart. Four distinct ends have now to be attained if possible. In the first place, the blood, and the substance, weight and vigour of the body have to be restored. This process calls for food, air, moderate exercise, cheerful surroundings, iron, and time—and for all of these even more than is the case after the majority of acute diseases. If the valves have been damaged, it is now that the process of repair, still actively proceeding, must be controlled, for it is in convalescence that the lesion may be aggravated and confirmed as chronic valvular disease on the one hand, or diminished

and possibly removed on the other hand, according to the treatment pursued. The principles already insisted on must still be observed, exercise being gradually and definitely ordered, and no attempt made, as was once the practice, to complete the cure of acute rheumatism by a day or fraction of a day earlier than the average! But functional as well as structural repair has to be accomplished. It is during convalescence that compensation of permanent valvular lesion is instituted. An indication is to promote compensation, and to establish it as soundly as possible in relation to the lesion, before the case passes out of our hands. As convalescence proceeds in a patient whose heart has been damaged by acute rheumatism this great therapeutic end becomes supreme. How compensation is to be attained will be considered in the next chapter under the head of the establishment and maintenance of compensation in chronic valvular disease. It is necessary, however, to say now that one of the essential conditions for the establishment of compensatory hypertrophy is an abundant supply of good blood, which demands in its turn plenty of food and air. Here a practical difficulty arises inasmuch as it may still be unsafe to allow a liberal diet or permit outdoor exercise. This brings us to the fourth end that has to be secured. *Recurrence has still to be prevented*, and rheumatism to be treated if it arise. We are landed here in a practical difficulty: we have to feed the heart and starve the rheumatism. In carrying out the restorative treatment so plainly demanded under the three previous indications, great care will have to be exercised lest the rheumatism return. The practitioner cannot make it too clear to the patient, or to the parents of the patient, that the chief cause of anxiety in the immediate future ought to be recurrence of rheumatism; this they forget in their concern about the heart directly. For a time the amount and kind of food consumed must be controlled; strict attention paid to the bowels and urine and the proper cleansing and clothing of the skin; and the strain of education entirely interrupted, lest chorea supervene. The sovereign remedy is time. In spite of the protests of the patient and his friends, no expenditure of time can be called unreasonable that is the means of thoroughly restoring his health, limiting the severity

of the valvular lesion, effecting complete compensation of the damage that is left behind, and last, but not least, eradicating the persistent disposition to rheumatism. In the case of a child the proper rule is to order his surroundings and life generally in such a manner that he cannot well do other than what is safe, and thus incessant warnings, disappointments and corrections are avoided.

Outline of Practice.

I. Commencement of the Case. — *General Management and Nursing.*—Rest in bed immediately; arrangements for several weeks' treatment (p. 277). Hot water tin or bag to feet continuously. *Diet.*—Fluids only, as in acute disease generally, as long as rheumatism continues and until salicylates have been removed without relapse (p. 272). Barley-water with lemon for thirst. *Stimulants:* as in other acute diseases, or if the heart fail. Spirits best, in small doses at short intervals, highly diluted. *Medicines.*—A brisk purgative pill (p. 273): ℞ Pilulæ Hydrargyri gr. iii, Pilulæ Colocynthidis et Hyoscyami gr. ii. [U.S.P. ℞ Massæ Hydrargyri gr. iii, Extracti Colocynthidis Compositi gr. iss, Extracti Hyoscyami gr. ½.] At once. To be followed by a saline purgative in six hours: Mitte Pulverem Sodæ Tartaratis Effervescentem, (B.P.) [Pulverem Effervescentem Compositum U.S.P.]. An aperient powder for a child of twelve years: ℞ Hydrargyri Subchloridi gr. i, Sacchari Lactis gr. ii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. i, Sacchari Lactis gr. ii.] At bed-time. A specific for rheumatism (p. 268): ℞ Sodii Salicylatis gr. 15-20, Aquæ ʒi. Every three hours for eight doses. Add to mixture if indicated by pulse (p. 272) Ammonii Carbonatis gr. iv, or Tincturæ Digitalis ♏v, or both.—For attacks of flatulence and præcordial distress:—(1) ℞ Spiritus Ætheris ♏xxv, Spiritus Ammoniæ Aromatici ♏xxv, Tincturæ Aurantii ♏xxx, Aquæ ad ʒi. [U.S.P. ℞ Spiritus Ætheris ♏xxv, Spiritus Ammoniæ Aromatici ♏xxv, Tincturæ Auranti Amari ♏xxx, Aquæ Destillatæ ad ʒi.] When required. (2) ℞ Hydrargyri Subchloridi gr. ii, Sacchari Lactis gr. iii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. ii, Sacchari Lactis gr. iii.]

At bedtime; to be followed by a saline purgative (as above) in the morning.—For attacks of serious cardiac failure, a hypodermic injection of 3 minims of Liquor Strychninæ Hydrochloridi. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏x.]

II. Progress of the Case.—1. *At second and subsequent visits.—General Management and Diet*, as before. *If rheumatism be controlled:* frequency of salicylate to be slowly reduced (p. 275) to every four hours; every six hours; every eight hours; the dose reduced to ten grains; and so on until (all going well) it is stopped several days after cessation of pyrexia.

If relapse of rheumatism: salicylates to be immediately resumed; and again gradually reduced and stopped (p. 275).

2. *Later Stage. — General Management and Nursing.* Avoidance of efforts in bed—stretching, lifting, or holding heavy books, etc. Avoidance of excitement even of a pleasing kind (p. 273). Patient to keep his bed for at least fourteen days after disappearance of pain and fever. Ability to bear the exertion of sitting up to be tested by pulse (rate and rhythm); præcordial signs; and absence of dyspnœa, cough, faintness and palpitation, rise of temperature and relapse of rheumatism. Very gradual, graduated, return to work. *Food.*—Fluids to be changed for farinaceous foods, fish, chicken, mutton, light non-flatulent vegetables, in careful succession, the effect of each step being observed by reference to temperature, joints and heart, and fluids resumed if rheumatism threaten to return (p. 272). *Medicines.*—Mild hæmatinic and antacid mixtures (p. 276): (1) ℞ Potassii Citratis gr. xx, Ferri et Ammonii Citratis gr. x, Aquæ Chloroformi ℥i. [U.S.P. ℞ Potassii Citratis gr. xx, Ferri et Ammonii Citratis gr. x, Aquæ Chloroformi, ℥iv, Aquæ Destillatæ ad ℥i.] Three times a day, after meals. (2) ℞ Tincturæ Quininæ Ammoniatæ ♏xxx, Ferri et Ammonii Citratis gr. x, Glycerini ♏xx, Aquæ ad ℥i. [U.S.P. ℞ Quininæ Sulphatis gr. $\frac{1}{2}$, Aquæ Ammoniæ ♏iii, Alcohol ♏xx, Glycerini ♏xx, Ferri et Ammonii Citratis gr. x, Aquæ ad ℥i.] Three times a day, after meals. Regular aperients, as required.

3. *Convalescence.*—Treatment for establishment of compensation (see p. 276).

Acute Pericarditis

The treatment of acute pericarditis is a subject of far less interest to the practitioner than the management of inflammation within the heart and chronic valvular disease. At the same time a study of the disease serves to illustrate in an instructive manner several therapeutical principles of importance. The cause or nature of the inflammation proves to be the key to the course which it follows: pericarditis associated with rheumatism ends favourably; with Bright's disease it usually terminates in death. The pathological changes in the pericardium show a remarkable tendency to spontaneous arrest, provided the cause be controlled. They present a complete picture of the different stages of acute inflammation, proceeding to removal of the products and the establishment of fibrous repair. Further, what little functional disability is produced by adhesions proves to be insignificant compared with the unhappy results of concomitant valvulitis, and is speedily and easily compensated by hypertrophy of the heart. We shall now study these different points in their natural order.

Etiological Indications.—Acute pericarditis in a large majority of instances has the same causal relations as acute endocarditis, with which it is usually associated. In other words, we are seldom called upon to treat it apart from rheumatism or chorea and acute infective processes: and under these circumstances attention to the cause constitutes the chief part of our duty. The patient is in bed, and as a rule under the influence of salicylates when the pericarditis supervenes; and he remains strictly cared for until the inflammation naturally ends. In a well-defined but happily small number of instances acute pericarditis is referable to Bright's disease, acute or chronic. It then constitutes in itself or along with inflammation of other serous cavities one of the gravest complications, ending very frequently in death. In these instances also the ætiological relations of the disease have to be kept prominently before the mind, with respect especially to feeding, elimination,

and the liability to uræmia and the other grave incidents of the nephritis.

Pathological Indications.—The feature in the pathology of acute rheumatic pericarditis which most interests the practitioner is its disposition to spontaneous recovery. Provided the cause and associated inflammation of the endocardium receive proper attention by rest in bed and specific treatment, it is rarely necessary to attempt to modify the hyperæmia, effusion and subsequent resolution proceeding around the heart. The activity of the first stage of the inflammatory process can be reduced by the local application either of heat in the form of poultices, or of cold by means of the ice-bag; and either of these methods may be employed as they possess the further advantage of relieving local discomfort. Leeching also fulfils both indications, and especially gives remarkable relief from cardiac distress. Practitioners disposed to active treatment pursue the inflammatory process through its next stage, effusion, with blisters and absorbent drugs, such as mercurials, potassium iodide, and saline and other diuretics. As a rule these proceedings are unnecessary, and they interfere more or less with the treatment of acute rheumatism and endocarditis. But in association with acute nephritis pericardial effusion should be treated with free counter-irritation, and the addition of digitalis to the remedies ordered for the primary disease. The most important indication at this stage is to support the heart, which may be the seat of a degree of myocarditis. Undoubtedly as a very rare event pericardial effusion calls for attention from us on account of its bulk or persistency. The remedies just mentioned may then be tried for a short time; but if they fail or if the condition become urgent, *paracentesis pericardii* is to be performed.

Adhesion of the pericardial layers as the result of pericarditis is a form of repair which usually leads to no serious results; and which may be regarded as beyond the power of treatment to avert.

Clinical Indications. — The striking physical signs of acute rheumatic pericarditis are no doubt accountable for the active treatment which this disease so often receives. If they

are faithfully watched and interpreted as they appear, increase, decline and disappear, such interference usually will prove to be uncalled for. On the other hand, the symptoms of pericarditis, although quite often absent or lost in the presence of those of the primary disease, may indicate the need of attention to the heart, and also of direct relief of distress. Præcordial pain, objective and subjective anxiety, and palpitation are allayed to some extent by the local applications already named, particularly leeching, as well as by the nursing and general management of the rheumatism. When further measures are required, two remedies are of great value—opium (or morphine) and the presence of a cheerful and judicious friend in whom the patient has confidence. A combination of morphine and strychnine hypodermically may afford relief in urgent distress. Mental and bodily rest and comfort are as indispensable as in endocarditis. The existence of pericarditis calls for no modification of the diet recommended for acute valvular disease.

Outline of Practice.

A.—*Acute Rheumatic Pericarditis.*

I. Commencement of the Case.—*General Management.*—Rest in bed. Posture as may be most comfortable. *Nursing, Diet, Stimulants, and Medicines* as in rheumatic endocarditis (p. 278). Bodily and mental quiet indispensable (p. 273). *Local Applications.*—Light linseed meal poultice, changed every four hours. Or ice-bag if preferred (p. 281). If sense of anxiety or pain great, 6-12 leeches to sternal region. Or hypodermic injection of morphine (♏ 2-♏ 5 B.P. 1898). *For sleeplessness and distress generally:* (1) Pulveris Ipecacuanhæ Compositi (B.P.) [Pulveris Ipecacuanhæ et Opii U.S.P.] gr. x. at 8 to 10 P.M. (2) In more severe cases; ℞ Injectionis Morphinæ Hypodermicæ ♏ iii, Liquoris Strychninæ Hydrochloridi ♏ iii. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{4}$, Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏ x.] Hypodermically, at 8-10 P.M. Hot milk and brandy or whisky.

II. Progress of the Case.—As in acute rheumatic endocarditis (p. 279). (1) *If effusion large:* wait, unless symptoms

urgent; or blister præcordia with Emplastrum Cantharidis (p. 281). If urgency arise, perform *paracentesis pericardii* in the fourth left intercostal space, one inch from sternal border (p. 281). (2) *When effusion has disappeared.*—Reduce doses of salicylates; combined with digitalis and iron, as demanded by primary disease and endocarditis (p. 279). (3) *Convalescence.*—Prolong period of rest. Guard against return of rheumatism. Favour compensation (p. 288).

B. *Acute Pericarditis in Acute Bright's Disease.*

Observe the plan of treatment for acute Bright's disease (p. 328). Stimulants, highly diluted, up to 3 fl. oz. of brandy. Modify medicines: ℞ Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ʒiv, Tincturæ Digitalis ♏v, Aquæ ad ʒi. Every four hours. *Locally.*—Leeches to præcordia or wet cupping, or dry cupping. Counter-irritation with Liquor Iodi Fortis, B.P. if effusion be large. Paracentesis may be necessary.

C. *Acute Pericarditis in Chronic Bright's Disease.*

Observe the plan of treatment for chronic Bright's disease (p. 345). Rest in bed. Nurse. Prepare for grave illness. Warmth of skin, etc. *Food:* Milk, farinaceous foods made with water, or milk and water. *Stimulants:* if demanded by pulse, etc. *Locally.*—Leeches, dry cupping, wet cupping. Energetic counter-irritation with iodine as above. Paracentesis may be necessary, but is not usually of avail.

CHAPTER XI.

CHRONIC VALVULAR DISEASE OF THE HEART.

The rational treatment of chronic valvular disease of the heart demands great variety and breadth of knowledge—of physiology, pathological anatomy, the ætiology of disease in general and the actions of remedies. All this is necessary for the theoretical discussion of the subject; and in practice not only this, but also delicacy and accuracy of diagnosis, clear appreciation of the particular problem to be solved, and great judgment in employing the means of treatment. The reason of this is not far to seek. Chronic valvular disease is not a single or constant pathological condition. It comprises a number of different pathological processes and a variety of stages or phases which are of different, indeed opposite, significance and call for totally different kinds of management. For clearness of exposition, the therapeutics of the two extreme states in this series, compensation and failure, must be considered apart.

The best order for us to follow in this discussion is the natural history of the disease itself. Chronic valvular disease begins with the lesions wrought by acute endocarditis which were considered in the last chapter, or with chronic inflammatory or degenerative processes of more insidious development. These anatomical changes, whatever their particular seat and form, aortic or mitral, obstructive or regurgitant, are calculated to disturb the balance of the circulation in the directions of underfilling the arteries or lowering arterial pressure, and permitting unnatural delay and accumulation of blood within the different chambers of the heart and the veins behind it.

Side by side with this destructive process, there arises, and is gradually perfected, a process of physiological recuperation, which we call compensation, represented by enlargement of the heart and other changes in the associated vessels and viscera. The abnormal accumulations of blood in the different chambers and the abnormal distribution of the blood and blood pressure in the veins, heart and arteries are provided for by dilatation of the different cavities and vessels, by hypertrophy of the cardiac walls, or by both. If the valvular lesion be non-progressive, as is usually the case, a condition is presently reached in which the disability attending it is practically removed. The first phase of chronic valvular disease ends here. It is conveniently called the *establishment* of compensation. The second phase consists in the *maintenance* of compensation, the preservation of reasonable physiological capacity of the heart in the face of permanent valvular lesion. The establishment and maintenance of compensation are based on the same natural provisions and favoured by the same methods of treatment. They, therefore, fall together conveniently for the purpose of discussion, constituting the first division of our present subject. The third phase of valvular disease may supervene at any time, according to circumstances. Compensation breaks down; and the many distressing symptoms familiar to us in cardiac dropsy make their appearance. This is *failure of compensation;* and it will receive separate consideration in the second division of our subject. Spontaneously, or as the result of treatment, *compensation may be restored* or re-established—to break down at a later period; again probably to be re-established; and so on until the end. These alternate failures and recoveries constitute repetitions of the original series of phases, and do not call for discussion apart from them, under the two divisions just named.

Establishment and Maintenance of Compensation.

In the last chapter we traced the course of acute valvular disease as far as the point where convalescence begins to be accompanied by compensation in the form of enlargement of the heart. We have now to continue the natural history of

valvular disease from that point, and to study its rational treatment in relation to compensation.

Ætiological Indications.—In the great majority of cases the ætiological relations of chronic valvular disease might be regarded as an affair of the past. The lesion is permanent damage wrought by previous rheumatism. It is too late to speak of prevention, or of treatment directed against the cause. The mischief is done and irretrievable. We find, however, that this consideration must not be pushed too far when we are dealing with the development and first establishment of compensation. As we saw in the last chapter, the risk of relapse of rheumatism often haunts the period of convalescence from endocarditis, especially in children, and has to be reckoned with practically. It therefore happens that an important ætiological indication does exist, in young subjects at any rate, and has to be followed in connexion with compensating and indeed with compensated valvular disease, namely, the prevention of increase of the lesion by fresh endocarditis.

It is necessary to insist upon this point once more. The attention of the patient and his relatives is absorbed by anxiety about the heart itself: the danger of return of the very disease in which the valvular lesion has just originated is overlooked. The practitioner must instruct the child's parents that for the first few months, at least, after an attack of acute endocarditis they will have to continue on the outlook for the slightest threatenings of rheumatism. The child must be warmly clad, and avoid cold and damp in the matter of residence as well as of weather. Close attention must be paid to the diet; and to the daily action of the bowels and the characters of the motions. Suspicious thickness of the urine must be met with purgation and reconsideration of the diet. At the same time a faithful watch must be kept on the nervous disposition of the child. If sore throat, urticaria, unaccountable pyrexia, wandering pains in the limbs and body, palpitation, pleurisy, twitchings, nervousness, nocturnal restlessness or other suspicious symptoms make their appearance, anti-rheumatic treatment must be instituted without delay, in the form of rest, liquid nourishment, a smart purge, and the exhibition of full doses of the salicylates.

The ætiological indications for the prevention and treatment of chronic valvular disease originating in other causes than acute endocarditis—strain, syphilis, degeneration, etc. —do not call for special discussion in the present place. Specifics are demanded in cases distinctly traced to syphilis, and are sometimes entirely successful.

Pathological Indications. — In compensated valvular disease the lesion and the evidences of the conservative process are very clearly seen side by side. One or more valves are incompetent or obstructed: the chambers are dilated and their walls hypertrophied. As we have seen, the destructive process in valvular disease originating in acute rheumatic endocarditis is usually at an end. Indeed the stenosis or incompetence is directly due to the unfortunate method of repair. We must be content if the lesion do not increase. It is different however with syphilitic and degenerative changes, for they are often progressive. The former, as we have already seen, calls for iodide of potassium. Degeneration, as a pathological change, indicates a combination of nutritive, hæmatinic and absorbent measures, and moderate graduated exercise. For this kind of "senile heart" great skill and care are demanded in the use of light nutritious non-flatulent food, iodide of potassium, arsenic, iron, small quantities of stimulants well-diluted, and tonic doses of digitalis and nux vomica continued over considerable periods of time. Here it may be conveniently said that in every case of chronic valvular disease, whether primary or secondary to endocarditis, the importance of insuring the nutrition of the valves against the oncome of degenerative and infective processes must be kept prominently before the mind. The amount of attention now paid to exercise of the myocardium in the management of compensation has left this point comparatively unregarded.

The second pathological indication in connexion with the establishment and maintenance of compensation is drawn from the conservative changes found in the heart. This is to insure the conditions favourable to the two great methods of spontaneous recovery, namely hypertrophy, and dilatation with efficient hypertrophy. We have already studied these conditions in Part I. They are: an abundant supply of pure nutritious

blood in the coronary vessels; wholesome nervous influences on the heart; strict moderation of the increased work demanded of it; perfect extensibility; and time. The practical question is, how these conditions are to be fulfilled in valvular disease. This subject will be more profitably discussed when we come, as we do now, to consider the directions to be given to the patient under the head of Clinical Indications.

Clinical Indications.—Compensation implies that the heart is discharging its functions sufficiently; and our chief clinical guide in promoting the establishment and maintenance of this great process of natural recovery in rheumatic valvular disease is therefore the absence of symptoms in spite of the varied and increasing demands upon the heart which convalescence entails. If the patient under these circumstances habitually suffers neither from palpitation, dyspnœa nor præcordial discomfort, we conclude that compensation has been begun well; if the amount of physical examination and of gentle exercise that he can bear without the appearance of such symptoms is considerable and increase from week to week, we say that compensation is being established satisfactorily; if he can resume what may be broadly called the ordinary duties of life without being aware that he has a heart, we congratulate ourselves that compensation has been established completely and can be maintained. Here, however, it will be well for us to remember that compensation is a relative term only, intended to express the fact that the heart has regained its power to some extent or other in relation to the demands made upon it. We speak of "gentle exercise" and of "the ordinary duties of life"; but it is obvious that these are different in every patient, and that a diseased heart may be compensated for work of that degree but not for climbing hills, taking part in a campaign, or conducting an extensive business. Indeed in the face of some grave valvular lesions and other disabilities the patient may have to remain in bed in order to maintain compensation. Similarly or conversely, "failure of the heart" is an elastic term. Every attack of dyspnœa, palpitation, faintness or præcordial distress in valvular disease is not regarded as evidence of failure. Compensation is bound to be taxed occasionally by sudden calls for exertion or unexpected

excitement ; but we regard the effect on the heart as nothing more than temporary embarrassment, comparable to that felt by the healthy man, only less readily and severely. It thus appears that no rigid line can or ought to be drawn between compensation and failure. Neither of them is a fixed or constant condition. Only for clearness of description the two extremes must be discussed separately.

The physical signs of compensating valvular disease also furnish indications of capital importance. They inform us of the seat, form and perhaps the severity of the valvular lesion ; of the size of the heart, and the character of the enlargement ; of the condition of the circulatory system generally ; and of the weakness and irritability of the myocardium, as tested by the effect of definite exercises undertaken in our presence on the rate and rhythm of the heart, on the pulse, complexion and respiration. Altogether we have at our disposal and ought systematically to employ in every instance as it comes before us, and from time to time, a large body of clinical evidence by which we can judge how far compensation is being or has been established ; whether the ultimate result promises to prove complete or no, and is likely to be maintained ; whether there be any necessity for interference in its favour, and if so, which remedies ought to be employed ; and lastly, in strictly practical application of these conclusions, what amount and character of work and responsibility the patient may be recommended to undertake. It is to be clearly understood that this evidence must be elicited in each individual case by means of intelligent examination and consideration. Advice founded only on general principles cannot be made sufficiently definite to be of practical service.

When we have completed this estimate, our first duty to our patient in this connexion is to give him plain instructions in the general management of his life and health and to restore his blood. Keeping before our minds the conditions which favour hypertrophy and accommodative dilatation, we naturally begin by directing attention to the digestive, absorbent, hæmopoietic and eliminative functions. Food must be abundant and nutritious ; but we do not forget that the rheumatic subject is naturally hearty, and that his appetite may have

to be restrained instead of being encouraged. Daily evacuations of healthy, well-coloured motions must be insured. If constipation occur, aloetic laxatives in combination with iron and nux vomica will best meet the indications. In most cases a course of iron in suitable form is required. The urine should be inquired into from time to time. Equally necessary to the restoration of the blood, which has been so seriously reduced in amount and value by recent rheumatism, are fresh air and sunlight. Persons who have just recovered from acute endocarditis with permanent valvular lesions, particularly children, should if possible prolong their convalescence for months in the country, as we have already seen, leading an open out-door life, with all proper precautions to be presently described.

In the second place the nervous impressions which reach the heart must be kept under strict control, and indeed be definitely ordered and regulated. In most adults this is difficult, and it may be impracticable, in consequence of the demands of business and of the complex and unavoidable anxieties of a personal, domestic or family kind to which they must return. Some high-spirited persons are at first disposed to resent the suggestion of their incapacity, and the restrictions entailed by treatment, which they feel keenly. The struggle is sometimes long and anxious, but time always comes to their assistance, reconciling them to their condition; and the worry and its unfavourable influence on the heart presently pass away. In the case of children the establishment of compensation involves re-consideration and possibly re-arrangement of their education. The loss of valuable time during a prolonged rheumatic attack and subsequent debility have left the child backward as well as excitable; and emotional distress and intellectual strain may be very readily induced by study. These are not only very unfavourable influences to fall upon the compensating heart, but they may prove causes of chorea with its attendant cardiac mischief. We find in this another powerful indication for a period of quiet country life.

We have now to discuss with particular care the third condition of compensation by hypertrophy, the control within reasonable limits of the increased demands made upon the heart for physiological work. What is reasonable in the

particular case having been carefully estimated, as we have already seen, we might forbid exertion or over-exertion whether of a sudden and violent or of a prolonged and sustained kind. This advice would be too general to be of much service. In the adult we have to enter into details connected with the patient's occupation and amusements. It is rarely necessary to advise a man to change his occupation unless it involve great physical strain or the lesion be uncommonly severe. The more active kinds of sport must be forbidden for a time. As regards children and adolescents lately recovered from rheumatic endocarditis, the subject of schooling which we have just discussed involves that of recreation and physical training. The question is always definitely put to us what games they may resume. Many out-door amusements are quite permissible. Simple running about in fields and country lanes is sufficient to begin with. Quiet cricket may be allowed to lads with recent heart disease who are otherwise able to be at school with their fellows; but matches, where boys' courage might not allow them to give in until it was too late, are to be forbidden for the present. Football and paper-chases cannot be permitted; nor cycling for some months, when it may be resumed with caution. But whilst strict control must thus be exercised of the increased work thrown on the compensating heart in these different ways and in different subjects, the grave error must be carefully avoided of reducing exercise below reasonable limits. It is not so long since hypertrophy of the heart, and, still more, efficient hypertrophy with dilatation were regarded as morbid, and the view extensively held that the correct way to meet valvular disease is to give up work, retire from business, avoid all kinds of sport, and lead practically the life of an invalid or valetudinarian. Of course this is one of the two possible ways of meeting cardiac disability or any other difficulty of life—to give way to it, to bring work down to the level of it. The other way is to face and overcome the difficulty: to bring our capacity up to the level of it by encouraging hypertrophy, the presence and success of which is the best because the natural proof of the soundness of the principle of exercise (see page 221). In order to avoid both errors—premature and

excessive cardiac work on the one hand, and abuse of rest on the other hand—the excellent system of exercise in heart disease has come to be employed. Introduced many years ago by Stokes of Dublin, and consistently recommended during the whole of this time by leading English authorities on the treatment of disease of the heart, it has recently been elaborated in the form of graduated exercises and movements by Oertel and Schott. Without having recourse to these elaborate methods we can easily regulate the degree and duration of deliberate exercise of ordinary kinds. The safe rule to follow is to feel our way, judging the effect on the heart by the patient's sensations; by the force, frequency and regularity of the cardiac action and the other characters of the pulse; by the evidences of pulmonary embarrassment—dyspnœa and cough; and by the evidences of arterial anæmia—pallor, faintness and giddiness.

An anxious question often put to the practitioner at this time relates to the future career or life-work of boys with damaged hearts. All the public services are practically closed against them. The more arduous professions, such as Medicine and Engineering, can be recommended only to a few, the subjects of slight mitral incompetence or slight aortic disease. The Church is open to more severe cases: Art to a few; business, involving different degrees of responsibility and physical strain, ultimately gives occupation to a great many of the subjects of heart-disease. In every case the final choice should not be hastily made; for considerable changes may occur in the condition of a boy's heart in the course of the first twelve months. These changes are mostly in the direction of improvement, and in a certain proportion of instances (unhappily very small), the evidences of valvular disease altogether disappear. Many of these remarks apply also to girls. In valvular disease of any degree of severity, particularly in mitral stenosis, mothers should be early advised to discourage the idea of marriage.

Our second duty to the subject of chronic valvular disease in this respect is to instruct him what symptoms, if they should occur, he is to regard as evidences of inadequate compensation. The most early and recognisable of these are

palpitation, dyspnœa, faintness and præcordial distress. He ought to be taught to regard these as useful signals or warnings that he is contravening the rules of health which have been given him, and that reconsideration and reform in his manner of living are required. The more rational mode of treatment (he must understand) in these circumstances is to reduce the demands on the heart and to remedy any faults that he may be committing in his habits generally, rather than to employ drugs to enable the heart to over-work itself.

INDICATIONS FROM THE COURSE.—The preceding review of the pathological characters, conditions and limits of compensation cannot fail to impress on us the necessity of *time* for its establishment. We have repeatedly insisted on the importance of prolonged convalescence after rheumatic endocarditis for other reasons; here we find a powerful argument in favour of giving these subjects abundant time in which to furnish the heart with capacity for the serious work of life. Once established, compensation in valvular disease pursues a chronic course; its duration is indefinite and happily often long. Sooner or later however, with few exceptions, failure occurs, which results in either temporary recovery—perhaps repeatedly, or in death. This comprehensive statement will suffice to remind us that the principles on which the management of compensation was based must be respected permanently. Physical work and mental strain must not only be brought down to the level of the cardiac capacity, as we saw in connexion with the clinical indications: they must be kept down. The capacity of the heart must not only be raised, as we also saw, it must be kept high. After compensation has been established, it must be *maintained*. This is a serious undertaking on the part of the practitioner and of the patient. Extensive knowledge of the world and breadth of view are called for here; and invaluable counsel can be given, not only to the parents of young subjects of valvular disease but to the subjects themselves, on the importance to them of temperance and prudence generally. The practitioner will always keep before himself the prime object of treatment. This is to maintain such a relation between the driving power of the heart and the resistance which it has to overcome, that the former is always greater than the latter and the available

balance or reserve of power as large as possible. This relation is differently attained and maintained in different subjects, according to the seat and degree of the valvular lesion, the perfectness of the compensatory mechanism, and the demands made on the heart; and it is also uncertain or shifting in the same subject under different circumstances. In some persons the balance in favour of the driving power is so small that the condition is precarious; other persons re-acquire so much reserve that they enter fully into the duties of life, being "perfectly well." Periodical examination of the heart and of the other viscera, and reconsideration of all the circumstances of the case, however well the subject of chronic heart disease may feel, are the best means of insuring continuance of compensation.

But in all subjects of compensated valvular disease the balance may be disturbed. On the one hand, the resistance ahead—the work to be done by the heart—may be increased; whether naturally, by age, pregnancy, etc.; incidentally, by cold, or acute illness for example; deliberately, by occupation; or carelessly or viciously, by the development of bad habits. For the practitioner to increase the force of the heart to meet such difficulties is not a serious task, but it is necessarily a costly and possibly a hazardous one which calls for judgment. On the other hand, the driving power of the heart may fail: whether naturally, from age or the functional anæmias of women; or in consequence of disease, disorder or neglect. The nutrition of the wall of the heart must therefore be carefully provided for. In either event, whether mischief begin in the resistance or begin in the myocardium, cardiac symptoms (palpitation, pain, dyspnœa, faintness) are to be accepted as evidences of insecurity of compensation, and as calling for measures to strengthen the physiological relation or balance on which alone the circulation can be maintained: not as simple calls for direct relief. It will be gathered from these considerations that the routine management of chronic valvular disease of the heart with compensation consists in great measure in preventing evil or meeting it when it does arise. In other words the maintenance of compensation may be regarded with advantage as the prevention of failure of compensation by anticipating or dealing

with the causes of failure. We have to reckon with liability to failure from such circumstances as we have just noticed, and from others that occasionally supervene. What these causes of failure are in detail and how they are severally to be met will be discussed in the next section.

Outline of Practice.

General Management.—Occupation in the form (1) of work and (2) of relaxation definitely arranged after deliberate and complete estimate of the lesion and the circumstances of life, age and sex (p. 291). A period of quiet open-air life in the country rather than on the coast, free from business or study, highly desirable to commence with. Reconsideration of *education* in children; selection of a school for boys with respect to lessons, physical training, and climate in the fullest sense of the term (pp. 290, 291). *Clothing:* to prevent return of rheumatism (p. 286). *Food:* nutritious, plain, non-flatulent, and definitely controlled in quantity (p. 289). Stimulants better avoided. *Attention* to bowels and urine indispensable (pp. 286, 290). *Prompt treatment of rheumatism* in every phase (p. 286). *Medicines.*—Hæmatinics in various combinations (p. 290): (1) Simple: ℞ Pilulæ Ferri gr. v. [U.S.P. ℞ Pilulæ Ferri Carbonatis.] Three times a day after meals. (2) With laxatives: (*a*) ℞ Ferri Sulphatis Exsiccati gr. i, Extracti Aloes Barbadensis gr. i-ii, Myrrhæ gr. ½, Extracti Belladonnæ Alcoholici gr. ¼, Extracti Taraxaci q. s. ut fit pilula. Every evening. (*b*) ℞ Magnesii Sulphatis gr. xx, Liquoris Ferri Perchloridi ♏ viii, Aquæ Chloroformi ℥i. [U.S.P. ℞ Magnesii Sulphatis gr. xx, Liquoris Ferri Chloridi ♏ i, Aquæ Chloroformi ℥ iv, Aquæ Destillatæ ad ℥i.] Three times a day after meals. (3) With cardiac tonics: ℞ Tincturæ Ferri Perchloridi ♏ x, Tincturæ Digitalis ♏ v, Liquoris Strychninæ Hydrochloridi ♏ iii, Acidi Phosphorici Diluti ♏ xv, Aquæ ad ℥i. [U.S.P. ℞ Tincturæ Ferri Chloridi ♏ x, Tincturæ Digitalis ♏ v, Strychninæ Hydrochloratis gr. $\frac{1}{36}$, Acidi Phosphorici Diluti ♏ xx, Aquæ Destillatæ ad ℥i.] Three times a day after meals. (4) With nervine tonics: ℞ Ferri et Ammonii Citratis gr.

viii, Liquoris Arsenicalis ♏iii, Ammonii Carbonatis gr. iii, Tincturæ Nucis Vomicæ ♏viii, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Ferri et Ammonii Citratis gr. viii, Liquoris Potassii Arsenitis ♏iii, Ammonii Carbonatis gr. iii. Tincturæ Nucis Vomicæ, ♏viii, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Three times a day immediately after meals.

Failure of Compensation.

Sooner or later in most instances the favourable but precarious course of compensated valvular disease is interrupted by the occurrence of palpitation, cardiac distress, dyspnœa and dropsy. In the great majority of instances the valvular disease itself remains unchanged. It is the myocardium that has failed. Compensation is broken.

Failure of the heart is most profitably discussed as an independent phase of valvular disease. It has its own causation, its own pathology, its own clinical characters and course; its pathogeny, prognosis and treatment are entirely different from those of compensation. Unless the practitioner consider failure on its own account and in respect of these different factors of the condition, of course not independently of valvular disease but in addition to it, he is not in a position to treat it with success. We propose therefore to discuss cardiac failure in valvular disease under the usual headings.

Ætiological Indications.—Compensation is not broken without a cause; and the rational treatment of failure of the heart begins with attention to the cause of failure. When failure makes its appearance in the quiescent phase of valvular disease it must have originated in some condition or circumstance unfavourable to compensation; and this has to be discovered and reckoned with before we are scientifically justified in dealing with the effect. Something has occurred either to weaken the cardiac wall and undo hypertrophy; or to increase the work of the heart to an extent beyond effectual accomplishment, the completion of systole; or to do both.

The most common of the conditions under which the compensated heart fails is muscular exertion—in work, exercise or sport. The load has been raised and kept perilously near

the driving power of the myocardium, which has at last broken down. A second set of causes are nervous, particularly the depressing emotions, distress, anxiety (about the heart itself amongst other things), worry in its many forms, severe and continuous mental strain, the burden of great responsibility —financial, mercantile or professional. Deficient blood-supply to the myocardium is a common cause of rupture of compensation. On the one hand, the coronary arteries may be obstructed by degenerative or syphilitic changes, a peculiarly unfavourable condition not uncommonly associated with lesions at the aortic orifice.[1] On the other hand, whilst the coronaries are intact, the blood within them may be impoverished or poisoned: it is either starved by poverty (a common cause of failure) or by indigestion; or it is wasted by hæmorrhages, discharges, the rapid growth and development of the body at puberty, or the periodical disturbances and demands that attend menstruation, pregnancy, parturition and lactation. Some of the poisons which lead to failure of the heart in valvular disease are intrinsic—uric acid and its allies, the products of disordered digestion, of deranged hepatic action and imperfect elimination. These causes are met with more particularly in the rich, sedentary and over-fed, and in all cardiac subjects who have been injudiciously condemned to rest, retirement and feeding. Extrinsic cardiac poisons are in everyday use—tea, coffee, tobacco and alcohol; and many drugs depress the circulation. The first two of these occasion passing sensations of distress and palpitation. Tobacco in excess markedly disturbs the cardiac action, and may have to be entirely given up before the heart is restored. Alcohol increases the activity of the circulation quickly and for a short time, and thus relieves cardiac distress; but the abuse of it seriously impairs the nutrition of the myocardium, and chronic intemperance is associated with a peculiarly hopeless form of dilatation.

One of the most anxious causes of failure of the heart in

[1] The blood-supply through the coronary arteries is precarious at the best in cardiac enlargement, as these vessels appear not to enlarge *pari passu* with the increase of cardiac muscle. Wild, *Med. Chron.*, Manchester, 1892, vol. xvi. p. 232.

valvular lesions is the onset of inter-current disease. This remark applies to all inter-current diseases of a serious kind, but there are some morbid conditions peculiarly unfavourable to compensation. These are, of acute diseases, affections of the lungs, rheumatism, and influenza: of chronic diseases, gout and granular kidney. Of the other diseases which handicap the heart in the struggle for compensation must also be specially mentioned increase of the valvular lesion in the shape of fresh endocarditis or progressive stenosis of the ostia; myocardial degeneration from age, coronary disease or injury; chronic myocarditis, and general arterial degeneration. Compensation may for a time keep pace with the increasing lesion by means of concomitant hypertrophy, but there is a limit to this process of functional repair. Indeed, sooner or later, the time comes in all but the most favourable cases of heart disease when the full limit of compensation is reached. This limit is placed on health and life by the occurrence of secondary changes in the viscera, including the myocardium itself, referable to the prolonged affection of the heart. Impairment and disturbance of the circulation in the lungs, liver, kidneys and nervous system produce functional disorders of every kind, and steadily sap the patient's nutrition. Thus the consequences of inefficiency of the heart are visited upon its own walls through the coronary arteries and veins, and through the quality of the coronary blood. The vicious circle is then complete, beginning and ending in the heart.

In the majority of instances, failure of the heart is caused not by one but by several of these conditions associated together, in the form of poverty, exposure, and the wear and tear of life both nervous and physical, or it may be indulgence, idleness and intemperance.

The preceding review of the causes of cardiac failure as they present themselves to us in practice is full of suggestions for treatment.

In the first place, the importance of the cardinal indication of all is very manifest: one of the means of restoring compensation will be *to deal with the conditions or circumstances which have interrupted it.* Our first concern should

be to enquire into and discover the cause of failure in the particular instance before us, and to remove it or otherwise control it. Physical exertion and occupation generally must be replaced for a time by bodily rest and quiet. Worry and other mental strain must be reduced as far as possible. Anæmia is to be relieved by attention to its cause, by means of good food, purgatives, fresh air and other wholesome influences and a course of iron. And so on with other causes. In the second place this mode of treating failure of the heart is usually practicable, a most encouraging consideration. It is not an impossibility that one proposes to attempt, like repairing the damaged valve; nor the obscure and uncertain action of some routine drug that has to be employed. The means of treatment and the choice of remedies are necessarily as extensive as the variety of the causes of failure themselves, and for the most part readily available. The poor over-worked, half-starved labourer may have the compensation of his heart restored by simple rest and warmth and food which he finds in hospital. The sedentary, free-living man requires the opposite line of treatment, namely, reformed feeding and graduated exercise; and of this there is abundant opportunity in different ways. If inter-current rheumatism be undoing compensation it is in salicylates that the remedy is chiefly to be found. Tobacco, alcohol and other cardiac poisons, if proved to be at work, are interdicted. Change to the country may be the best means of restoring compensation in an anæmic, ill-fed and over-worked woman in town. These are but a few illustrations of the employment of the ætiological indications, but they will suffice to show that the method is practicable as well as rational. Fortunately also, as a matter of experience, the method of treating failure of the heart in valvular disease by attention to the cause often proves successful. The credit given to digitalis for the relief of dropsy unquestionably belongs in many instances to rest; and if rest alone be ordered in proper cases it will answer the purpose. Failure of the heart from poverty, dyspepsia, anæmia and the abuse of stimulants is easily relieved for the time being by attention to the obvious cause, whether without or with other measures that may be indicated pathologically or clinically.

Unhappily, in certain circumstances, this system of treatment fails to be of service. The cause, for instance, may remain undiscovered. Our best efforts occasionally do not reveal why compensation has broken down. The patient's mental circumstances in particular may be impossible to fathom. In other instances the condition of the patient is so urgent that neither enquiry nor physical examination is justifiable: the discovery of the cause must be postponed whilst the chest is tapped or venesection performed, or strychnine or ether given for a time. In yet another set of cases the method is impracticable. Few causes can be removed completely: and other indications must be concomitantly or even previously attended to. Indeed over certain of the causes of cardiac failure we have little or no sort of useful control, such as degeneration of the coronary arteries, chronic Bright's disease, alcoholism, increase of the valvular lesion by the persistent rheumatism of childhood or the steady increase of stenosis of the auriculo-ventricular opening, nervous causes and those incident to female life. In each instance the attempt of course will be made by the employment of means which do not call for description here. We have also to confess that ultimately, whether sooner or later according to the nature and severity of the disease, the limit of compensation dependent on general visceral congestion and degeneration presents an unsurmountable obstacle to our therapeutical efforts. Again, it happens sometimes that the cause of failure, although obvious and within our power to remove, cannot be dealt with immediately. Inter-current diseases, like bronchitis, pneumonia and gout, have to run their course. Toxic effects take time to pass off. The blood cannot be renewed in a day. Weeks or months may be required to restore nutrition. Under all these circumstances we have to trust, whether for an indefinite or a limited time, to methods of treatment founded on the other indications which have now to be examined.

Pathological Indications.—The characteristic morbid appearance presented by the heart in valvular disease with failure is passive or residual dilatation: dilatation from accumulation of undischarged blood within the chambers. If the previous condition have been one of pure hypertrophy, for example, of the left ventricle in aortic obstruction or of

the right ventricle in mitral disease, there are superadded to it stretching of the walls and increased capacity of the chamber, referable to an entirely new circumstance, namely, insufficient emptying. If the previous condition have been one of dilatation from overcharging, with efficient hypertrophy, for example, of the left ventricle in aortic incompetence or of the left ventricle in mitral incompetence, over-stretching and over-distension aggravate it, similarly referable to insufficient emptying. The subject of residual dilatation in general has been fully discussed in Part I.; but as it affects the heart it calls for special notice here.

From one or other of the causes studied in connexion with the ætiological indications, the heart (say the left ventricle) fails in its systole to maintain a force sufficient to overcome the rising pressure within the aorta. Systole is prematurely ended whilst the evacuation of the ventricle is still incomplete, that is, uncompleted or unfinished; and a portion of the contents is left behind. In the next following diastole the ordinary charge is driven from the auricle into the ventricle and added to the previous residue, and compels accommodation by forcibly stretching the walls. In each cardiac revolution the same events occur. This is dilatation from insufficient emptying, residual dilatation, dilatation with failure of the heart.

Residual dilatation of the heart does not stop at the chamber first involved. The incapacity of the heart makes itself felt backwards. The accumulating residues in the chamber first dilated (let us say the left ventricle) presently become so considerable as to interrupt the free and sufficient flow into it from the left auricle. This is unable to sufficiently empty itself, and by the same residual process becomes dilated, involving along with it the pulmonary veins and capillaries, between it and which there is no valve. So high has the pressure now risen in the pulmonary artery that the right ventricle, whether previously hypertrophied or not, fails in its turn to sufficiently empty itself in systole, and undergoes residual dilatation involving even the tricuspid valves. The venous system next suffers. The centripetal blood-flow from liver, kidneys and the body generally is interrupted, and all these

parts become mechanically congested. Their vessels are distended, that is, dilated from insufficient emptying; and the results are nutmeg liver, portal congestion, intestinal fluxes, gastric catarrh, albuminuria, dropsy in its various forms and possibly hæmorrhages. The process of back-working, here described as theoretically occurring in stages, naturally involves the different portions of the circulation simultaneously in some degree. Increased resistance within the enfeebled heart no doubt makes itself felt at once in all the vessels "behind" it.

As we have already seen in discussing the subject in general in Part I., dilatation from failure, whilst an evidence of cardiac weakness, is the least evil of the possible results of a breakdown of the circulation. Dilatation is better than cardiac arrest, paralysis, spasm or rupture, which are the only alternatives. Being so, it may be regarded as relatively and even positively affording temporary relief, and furnishing an opportunity and a means of recovery. The distension of the cardiac chambers and veins, the gorged viscera, the serous effusions and the hæmorrhages, desperate as they are, provide the subject of heart disease with one more chance of recovery. Unfortunate though it be, dilatation with failure is strictly an accessory misfortune which often can be perfectly removed.

The indications to be drawn from a study of the pathology of residual dilatation of the heart are mainly three: To reduce the resistance within the cardiac chambers, *i.e.* the resistance to systole; to restore or increase the cardiac force and rehabilitate the hypertrophy; and to remove the residues which have accumulated behind the lesion.

No time should be lost in fulfilling the first of these indications: *to reduce the intra-cardiac resistance*, chiefly by means of rest in bed, or if bed cannot be tolerated rest in an arm-chair with the feet down, as we shall describe presently when discussing the clinical indications. The second indication under this head is *to increase the cardiac force* and rehabilitate the hypertrophy. Here there is an opportunity for the employment of proper food, a subject to which we shall return, and cardiac and cardio-vascular stimulants and tonics of different degrees and different kinds, the action of which might be said to be that they enable the heart to make

a more complete conversion of potential into active energy. As far as a stimulant effect is required, the swiftest of all are ether, ammonia and alcohol, which should be ordered without delay; and strychnine which acts immediately and satisfactorily when given subcutaneously. More lasting in their effects, specific in their action, but relatively far more slow are digitalis and its allies — strophanthus, squill, senega, caffeine, lily of the valley, etc. Of these digitalis is unquestionably the most valuable. The drugs of this group increase the force and therefore the effect of the systole; lengthen the diastole, during which the ventricle rests and the venous fulness is relieved; and along with contraction of the peripheral vessels as a whole, presently produce relaxation of those of the kidneys, and thus free diuresis. The abundant flow of urine, fall in specific gravity, and decline and disappearance from it of albumen are unmistakable evidence of restoration of the circulation, and at the same time a means of rapidly removing the dropsy. It is necessary for the practitioner to remember the comparatively slow action of digitalis. He must not expect diuresis much short of the third day; and during this critical period, whilst digitalis is being faithfully given but its effects are inappreciable, he must trust to rest, ether, ammonia, alcohol, proper feeding, etc., as well as to other remedies to be presently noticed — purgation, paracentesis, bleeding, potassium iodide, as the case demands. He will usually be rewarded for his patience and methodical management of the case by the appearance of fifty ounces of urine on the third day. During this time another condition of the re-establishment of cardiac hypertrophy will demand anxious attention, namely nervous rest. This will be discussed presently under the head of the clinical indications.

Purgation greatly contributes to the fulfilment of the third indication, the *removal of residues*, mechanical congestion and dropsy, and thus to the relief of the alimentary, nutritive and eliminative functions. A sharp purge with compound jalap powder, calomel or colocynth is given in different instances, according to circumstances, such as urgency, strength, the amount of dropsy and the presence of sickness. Considerable depression may attend free evacuation of the bowels; but it is

temporary, and is followed by a sense of great relief of dyspnœa and cardiac distress, and thereafter by general improvement if the case be tractable. Purgatives are to be repeated at short intervals until compensation begins to be restored. When the dropsy does not yield, or if it invade the chest and abdomen in quantity sufficient to cause fresh cardiac or respiratory distress, paracentesis must be performed. The direct removal of serous residues usually gives remarkable relief: greatest in the case of the chest, where the hydrothorax has been directly embarrassing the heart; scarcely less in large ascites, for the same reason; less striking but equally satisfactory in the extremities. In some cases paracentesis of the chest or belly is a matter of urgency, to be practised without the delay involved in purgation. Acupuncture of the limbs is usually resorted to with more deliberation, but it is chiefly indicated in rapidly developed anasarca; and its effect being obtained the drainage should not be unduly prolonged. Of all the methods available for the removal of mechanical congestion and its effects, abstraction of blood is the most powerful and the most swift, and it is usually reserved for the most urgent cases of cardiac failure, where the signs of over-distension of the right ventricle are present with great engorgement of the veins of the neck and liver. Venesection may then be practised, to the extent of from 10 to 20 or even 30 ounces. Wet-cupping or the application of a dozen leeches along the sternum, a method to which there is less popular objection, is usually completely successful in affording relief, and ought to be more frequently practised than it is at present. Dry-cupping, a method of temporary relief to the circulation, has an equally beneficial effect on the over-distended heart for a limited time.

As the heart and venous system become unloaded and the cardiac walls recover their vigour, compensation begins to be regained. All the measures which we have found to be indicated—attention to the cause of failure, rest, the control of the venous circulation, and the employment of cardio-vascular stimulants—are continued for a time after the disappearance of the urgent symptoms. How these are gradually relaxed and tonic measures introduced, to be followed later by exer-

cise, will now be discussed under the head of the clinical indications.

Clinical Indications.—In the treatment of failing heart we readily appreciate the value of the general principles on which symptoms are to be accepted as therapeutical guides. We have to translate cardiac symptoms and signs into the pathological states and physiological disturbances of which they are but manifestations; and we are to subordinate symptomatic to ætiological and pathological indications. It proves to be dangerous as well as irrational to follow the other and easier course and employ direct symptomatic treatment without further enquiry. Many of the clinical indications in valvular disease with failure are identical with the pathological indications which we have just studied, such as those furnished by dropsy, pulmonary and hepatic engorgement, and albuminuria. Clinically, however, we appreciate the condition more clearly, for we see the events of it before us, and we employ them properly as the evidences and tests of success and as guides to further treatment. At the same time, many of these symptoms, such as pain, anxiety, insomnia, faintness, dyspnœa and flatulence, are attended with distress or danger which calls for direct relief independently of the pathological condition itself: which indeed may be so urgent as to require instant attention. Thus there is also a large field for palliative treatment. We shall now consider the principal symptoms that call for individual relief in failure of compensation.

Palpitation in cardiac failure is a manifestation of difficult or disordered systole; and in its most severe forms is marked by great anxiety, orthopnœa and other phenomena of urgent illness. It is to be interpreted as evidence that the driving power is at a disadvantage in relation to the resistance, consequent on myocardial weakness, nervous disturbance, actual or relative increase of intracardiac resistance, or disturbed distribution of blood within the chambers, variously associated with each other. Gastric disturbance and flatulence play a large part in many of the worst attacks. Under ordinary circumstances palpitation does not demand or receive special treatment: it yields to the measures directed against the pathological condition. But in its severe paroxysmal form it

urgently demands relief by rapid stimulants and carminatives, such as ether, ammonia, aromatic tinctures and alcohol in other forms, which induce eructation whilst strengthening the heart; by either warm or cold applications to the præcordia or to the back of the left chest; and by establishing the confidence of the patient. Leeches over the sternum and a calomel purge are often invaluable. The best diet is *nil* in ordinary attacks; but if the palpitation continue for many hours or even days, peptonised foods, strong meat essences of small bulk, or rectal feeding should be employed. The prevention of attacks of palpitation is most effectually secured by strict attention to rest and quiet, and above all to the diet, in irregularities of which they too often originate.

Morbid sensations referred to the præcordia, such as discomfort, tightness, oppression, weight or pain, are directly significant of the disability under which the heart is labouring. When moderate and continuous these sensations may be safely left to disappear as the failure is controlled by radical measures. When severe and paroxysmal, on the other hand, like præcordial anxiety and angina pectoris, cardiac distress calls for immediate and direct treatment, as being not only distressing but gravely depressing to the heart. But here also the importance of a rational method of procedure is evident. The measures that act most certainly as cardiac anodynes are leeching, paracentesis, the nitrites, iodides, carminatives and stimulants, which reach the cause, evanescent or persistent, of the disorder. Morphine combined with strychnine hypodermically gives complete relief in the worst cases.

Faintness is the plainest evidence of acute failure of the circulation. It is one of the symptoms which are immediately recognised as demanding instant attention, particularly if it reach the degree of actual syncope. Recumbency, ether, alcohol and ammonia are both speedy and rational remedies. A supply of fresh air is essential; and simple fanning is the best means of removing slight degrees of faintness.

Dyspnœa, the most constant and striking of all the symptoms of cardiac failure, is referable to a variety of conditions which have developed in consequence of the incompetency of the heart. Disturbance in the distribution and

delay in the movement of the blood within the chambers, pulmonary congestion and œdema, oppression of the lungs and heart by hydrothorax and ascites, general anæmia and renal congestion, all interfere with oxygenation, oxidation and depuration of the blood and induce automatic acts of relief. These are reinforced by voluntary efforts consequent on a sense of respiratory distress, in the form of orthopnœa and greater frequency and depth of breathing. Any increase of these difficulties, or addition to them by movement or flatulence, induces immediate aggravation of the distress, which may be paroxysmal in character. Dyspnœa yields, as might be expected, to the radical methods employed directly against the cardiac failure. Rest, purgation, cardiac stimulants quickly enable the patient to breathe more comfortably. Paracentesis gives great relief, particularly removal of fluid from the chest, which is perhaps not sufficiently practised. In very urgent cases venesection or leeching is indicated, and used with good effect. For passing attacks of dyspnœa a dose of ordinary stimulant mixture is usually sufficient; the nitrites and even morphine may have to be resorted to in other cases.

Cough in failure of the heart, as far as it is a symptom of the disease itself, is referable to pulmonary congestion and œdema and bronchial catarrh. In its typical form it is induced by movement or other exciting causes of increased pulmonary congestion. Cough hardly calls for special treatment; and when it does so, cardiac stimulants are demanded, such as ammonia and squill; not sedatives.

Hæmoptysis in mitral disease with failure is the immediate result of pulmonary congestion. Though alarming it is salutary, and its occurrence generally gives the practitioner instruction which he ought to have gathered from the other symptoms before matters came to such a pass. It usually affords much relief of a temporary kind; but, on the other hand, it is an index of the degree of circulatory difficulty, unhappily of a permanent and possibly increasing kind, namely, mitral constriction. Manifestly hæmoptysis in failing heart calls not for its arrest but for increased relief of the pulmonary circulation. Attended as it is with dyspnœa and præcordial anxiety of a very distressing character, it ought to be met with

venesection, leeching or cupping. After a few hours it is often of itself so successful in relieving the urgency of the patient's condition that nothing more severe than a purge is required, and steady perseverance in the systematic treatment of the disease. We need hardly add that hæmostatics are contra-indicated.

Vomiting is a distressing symptom in cardiac disease which often requires individual treatment. It may arise in three ways at least: from mechanical congestion of the stomach, with catarrh and even hæmorrhagic erosion of the mucosa; from the use of digitalis or its allies, other irritant medicines, or unsuitable food; and from purely nervous disturbance, through the pneumogastric. Vomiting forms a link in the vicious circle which may ultimately prove fatal; and if it refuse to yield it accelerates the end. We have here to face a great practical difficulty. The food and drugs with which we have planned to restore the action of the heart are loathed; they aggravate the sickness by being rejected if taken: they depress the circulation, and increase the nervous and general vital exhaustion. In severe cases the best plan is to remove them altogether for several hours or even a whole day, trusting entirely to a teaspoonful of brandy-and-water at intervals; or to feed by the bowel and give digitalin and strychnine tentatively under the skin. Small sips of quite hot water, champagne, or brandy and soda-water, may be allowed and diluted prussic acid, bismuth subnitrate or cerium oxalate and calomel cautiously administered. Ice is apt to increase flatulence and distress. Short of rectal feeding and hypodermic medication, much can be done in less urgent cases by giving strong meat essences, peptones, or peptonised milk in small quantities closely repeated, stimulants in sparkling forms, bromide of potassium in an effervescing mixture, and small doses of calomel, which is rarely rejected and relieves portal and gastric congestion by free purgation. The chief difficulty lies with the digitalis. It ought not to be lightly given up; the form of preparation may be changed, or strophanthus substituted, or caffeine. By the third day relief may be looked for if drugs of this class are persevered with and retained.

Let us now illustrate the employment of some of the principal means which we possess for fulfilling the numerous indications reviewed in the preceding sections. The two principal objects to be kept before the mind in *dieting* patients with cardiac failure are to supply food of such kind and in such quantity as will yield abundant energy and build up hypertrophy; and at the same time to prevent indigestion in the shape of flatulence and sickness. The typical meal consists of light attractive solids, but these cannot always be taken or borne. Unless the case be urgent, bread-and-butter, fish, chicken and tender mutton in small quantities can usually be safely ordered. Vegetables must be replaced by bread and rice, or be very carefully chosen, only the most digestible and least flatulent, such as spinach, seakale and asparagus (when in season), being attempted at first. Lightly boiled eggs, peptonised preparations of farinaceous foods, bread-and-milk, milk puddings and the like may be taken at different meals; the very lightest of these, or small feeds of milk or broths, being given once or twice in the night if the patient be awake. Failure of appetite and disturbance of digestion should be met with a mercurial pill and saline purge rather than with slops. Alcohol is usually given with advantage in small regular allowances at meal times or with food otherwise. As Da Costa says, "except for gouty persons, it is right to allow alcohol in cases where we think digitalis applicable."[1] Simple spirits with water are the best in ordinary cases. When the condition is urgent, with distressing dyspnœa, anxiety and vomiting, feeding becomes very difficult, as we have already seen in considering the latter symptom. Liquid diet has then to be resorted to for a time, in the form of small quantities, frequently repeated, of peptonised milk or farinaceous preparations, beef-tea or meat essences, and egg-flips. Brandy may have to be more liberally allowed, up to four or six ounces, provision being made for extra doses in the event of fainting or other evidence of acute cardiac distress. In desperate cases rectal feeding has to be practised.

For reasons that we have already seen the sufferer from cardiac failure must *rest*. He must continue to rest for a

[1] Quoted, *Boston Med. and Surg. Journ.*, 1888, vol. cxix. p. 462.

sufficient time to insure completeness of recovery of compensation; and he must resume exercise in a deliberate, graduated manner. Let us consider this subject in detail.

Pain, dyspnœa and palpitation compel rest in the worst cases; and they may be accepted as safe practical guides. As a rule the patient is in bed with the head and shoulders supported on high pillows or a bed-rest, the dorsal position being maintained unless there be embarrassment of either lung or pleura. Occasionally bed cannot be tolerated, and then the feet must be lowered. This position can only be secured along with rest by placing the patient in a large arm- or easy-chair, which affords great comfort comparatively, the œdema pedum increasing at the same time—no doubt with temporary relief of distress so that sleep is obtained. The sitting posture, and still more the frequent shifting into bed and out of bed which some patients keep up, are certainly hazardous in respect of faintness; and it is possible that digitalis should be given with special caution if the patient cannot keep his bed. In less severe cases, or when urgent distress has been relieved, the patient is content to remain in bed. Then as compensation is restored, more and more freedom of movement may be permitted without breathlessness or palpitation. The next step, sitting up out of bed, must not be too early attempted, certainly not for a good many days after the disappearance of dropsy. The practitioner must be guided here by the result. If palpitation, præcordial distress, or dropsy return, the effort has been premature or excessive and must not be repeated for some time in the same degree. By and by, all going well, the patient may move about the room, and presently may be taken out in a chair or enjoy a drive; but the common mistake must be carefully avoided of permitting him to walk upstairs on his return. For several weeks, or it may be longer, the subject of recovering but still precarious compensation must be carried upstairs, lest he throw away, in the short effort of climbing, the reserve of cardiac force which it has cost him weeks to accumulate by treatment. It is an excellent plan, if it can be managed, to secure a bedroom for cardiac patients on the ground floor. The further stages towards the resumption of ordinary exercise will be conducted on the principles already laid down

under Establishment of Compensation. Graduated exercises suit some cases, whether alone, as resistance movements, or combined with Nauheim baths. The same methods are applicable in selected instances of threatening cardiac failure and of actual failure of slight degree. When dilatation is advanced or severe, rest is to be insured.

Sleep is an invaluable restorative in cardiac failure, and unfortunately is sometimes difficult or impossible to obtain. When bodily distress and anxiety are urgent, sleep is absent and replaced by great nervousness and restlessness, or it occurs in short snatches ending suddenly in fearful awakenings. In other instances there is simple insomnia without special distress of any kind. In the first class of cases, sleep is to be secured by the measures already directed to the general relief of the patient: the semi-erect or even sitting posture with firm well-padded support to the back, ventilation or quiet fanning, and it may be paracentesis or leeching, according to the severity of the symptoms. Alcohol, ether, strychnine and the presence at the bed-side of a kind, trustworthy and judicious friend or nurse are invaluable in different instances. When it is distinctly recognised that everything possible has been employed without success to remove the cause of the insomnia, and not till then, the question of direct hypnotics may be entertained. Chloralamid, sulphonal or paraldehyde may be tried and their effect noted in producing sleep, on the pulse, and on the colour and general aspect of the patient. In one class of cases where pain and great anxiety and restlessness are present, morphine is a sovereign remedy, given hypodermically alone or with strychnine and perhaps digitalin. A simple dose of this combination will afford complete and speedy relief, induce several hours of quiet sleep, and may be the turning point for recovery in severe cases of cardiac failure. An ordinary dose of potassium bromide may suffice in some highly nervous subjects. In the second type of insomnia, where the patient simply lies awake for hours, night after night, chloralamid is the best medicinal remedy, combined with occasional small feeds of light, warm stimulant food and a little brandy. Sulphonal and paraldehyde are more successful in other patients.

Elimination is more than ordinarily indicated in cardiac failure, for whilst pure as well as sufficient blood is required for the restoration of hypertrophy, there is a disposition to accumulate effete or ill-formed materials within the circulation. The purgation with which the condition is treated from the beginning and the diuresis which afterwards sets in when the case is doing well sufficiently contribute to this end.

Indications from Clinical Course. — Failure of compensation in valvular disease of the heart runs a chronic course, developing gradually as a rule and lasting an indefinite time. It then passes off, whether spontaneously or as the result of treatment, in a considerable proportion of cases—at least once. Compensation, thus restored, may again be maintained for an indefinite period; but failure commonly recurs, to run a similar course, only in a less favourable form. Finally, after one or two or many such occurrences, the disease terminates in death. The probability of temporary recovery of compensation, the completeness of it and the time for which it is again maintained vary widely in different instances, with the nature of the valvular lesion, the cause of failure, and the circumstances and individuality of the patient.

Our first practical consideration in this connexion will therefore be to shorten the period or duration of failure: *to restore compensation as soon as possible.* This is not simply a matter of shortening distress, an urgent indication in disease of every kind: it is also a matter of shortening the period of mechanical congestion of the lungs, chylopoietic viscera, kidneys, brain and myocardium, which deteriorate steadily under the influence of the disturbed circulation, making recovery of compensation increasingly difficult. This is also one of many reasons for preventing recurrence of failure. At each failure a certain amount of ground is lost, by degeneration of the viscera, which can never be perfectly regained; so that finally there is reached what we have described under the ætiological indications as the limit of compensation.

Our second practical consideration will always be to insure *thoroughness of the re-establishment of compensation* which we effect. If we properly appreciate the strong disposition to recurrence of failure, we shall make sure to begin

again well by rehabilitating hypertrophy. The disposition unfortunately at the present time is to permit the patient to return much too soon to work and excitement. He does so before that reserve has been re-acquired which must back serviceable compensation. The patient has been made well but not enabled to keep well; and he breaks down again in a few weeks or months. It is not enough to clear away dropsy and then let the patient get about: the feet may swell again in an hour. Similarly it is only by affording plenty of time and insisting on gradual trial of strength that hypertrophy can be built up again in a lasting form.

Thirdly, as restoration of compensation progresses, we have to observe the great general indication to modify treatment as may be required. The necessity for this will be plain, as recovery from failure is marked by fairly definite stages: the removal of urgent pain, dyspnœa and cyanosis; the disappearance of dropsy; the return of strength and colour. As the physiological conditions of the circulation gradually reassert themselves, with reduction of peripheral resistance, recovery of cardiac strength and removal of mechanical residues behind the lesion, it would be a mistake to persist in the same powerful measures as were indicated at first. The problem and therewith the indications have changed. Purgation is continued only at considerable intervals, and is finally suspended. The doses of digitalis are reduced in frequency and amount. The diet is made more free, as the portal system is liberated from congestion, and the digestive functions of secretion and absorption are restored. Other conditions that favour hypertrophy are now kept more prominently before our mind. Iron may presently be given without fear of its disagreeing. More license can be allowed in respect of pleasing mental occupation. Only we must be careful, in accordance with the second indication—thoroughness of result—to take each step deliberately, and to be assured of its security before a fresh move is made; and in particular to maintain bodily rest for a more lengthened period than other parts of the treatment, advancing here with extreme slowness and caution, and proving the result as we proceed.

Outline of Practice.

I. Commencement of the Case.—*General Management.*—Rest in bed; high pillows or bed-rest; blankets light. If bed intolerable, the sitting posture in a large easy-chair until relief is obtained (p. 310). Light, loose, warm flannel garments. Hot water bag or tin continuously to feet. A nurse essential. Attendance during the night necessary at first.

Diets.—No. 1. (p. 309) Light attractive solids unless definitely contra-indicated by nausea, vomiting or flatulence, or unless they disagree and aggravate præcordial distress. *Regimen:* five meals in 24 hours, namely: *Breakfast at* 8 *a.m.:* Lightly-boiled egg, toast and butter, or stale bread and bacon, cup of freshly made weak tea, or coffee or pure cocoa. *Luncheon at* 11 *a.m.:* Cup of broth or beef-tea, a finger of toast, half an ounce of brandy with water. Or (if egg have not been eaten at breakfast) five ounces of warm milk and egg with half an ounce of brandy; or egg-flip. *Dinner at* 2 *p.m.:* Boiled sole with two large tablespoonfuls of pure red beef-gravy or beef-tea, hot; stale bread; one ounce of brandy with water, or two ounces of old sherry; or two ounces of sound burgundy. On other days, instead of fish, tender, lean, underdone roast mutton or sweetbread, or chicken, or game; with spinach, asparagus, rice, or even potato put through a sieve—all tentatively and sparingly. Two tablespoonfuls of milk pudding or baked custard. *Tea at* 5 *p.m.:* One cup of fresh weak tea; bread and butter, rusk or dry biscuit. *Supper at* 7 *p.m.:* A small teacup of water arrowroot with one ounce of brandy; or of peptonised or pancreatised food. In some cases a small meal of sweetbread or white fish. *During the Night:* two or three feeds, according to urgency of case and sleep, of beef-tea or broth, tea with milk or infused with milk, and half an ounce of brandy. *Stimulants:* as directed under food. An extra allowance of at least two ounces of brandy for emergencies.

No. 2. If solids be contra-indicated or disagree: Milk in different forms, beef-tea, broths or meat essences—all in small bulk, at short intervals. Possibly rectal feeding in urgent vomiting (p. 308). *Stimulants:* $1\frac{1}{2}$ to 6 fl. oz. of brandy with or after the feeds, in water; also in emergencies.

Other non-medicinal Measures: If lividity, anxiety or dyspnœa be extreme (pp. 304, 307): 12 leeches to sternal region. Dry-cupping. Wet-cupping to 4 fl. oz. Venesection 5 or 10 fl. oz. Paracentesis of abdomen or of chest according to situation of effusion; subcutaneous punctures along shins with strict antiseptic precautions (p. 304).

Medicines.—A variety of hydragogue purgatives (p. 303): (1) ℞ Pulveris Jalapæ Compositi gr. 30-60. At once. (2) ℞ Pilulæ Colocynthidis et Hyoscyami gr. iii, Pilulæ Hydrargyri gr. ii. [U.S.P. ℞ Extracti Colocynthidis Compositi, gr. ii, Extracti Hyoscyami gr. i, Massæ Hydrargyri gr. ii.] At once; to be followed in 6 hours with Pulvis Sodæ Tartaratæ Effervescens (B.P.) [Pulvis Effervescens Compositus, U.S.P.], in 8 fl. oz. of warm water. (3) ℞ Pulveris Elaterini Compositi gr. iii. [U.S.P. ℞ Triturationis Elaterini gr. $\frac{3}{4}$.] At once. (4) ℞ Magnesii Sulphatis oz. $\frac{1}{2}$, Aquæ fl. oz. 1. At once. A selection of cardio-vascular stimulants and diuretics: (p. 303). (1) ℞ Potassii Acetatis, gr. xx, Tincturæ Digitalis ♏x, Tincturæ Scillæ ♏xx, Liquoris Strychninæ Hydrochloridi ♏iv, Infusi Senegæ ad. ℥i. [U.S.P. ℞ Potassii Acetatis gr. xx, Tincturæ Digitalis ♏x, Extracti Scillæ Fluidi ♏iv, Strychninæ Hydrochloratis gr. $\frac{1}{28}$, Infusi Senegæ B.P. ad ℥i.] Every four hours. (2) ℞ Infusi Digitalis ℥ii, Potassii Iodidi gr. v, Ammonii Carbonatis gr. iv, Infusi Senegæ ad. ℥i. [U.S.P. ℞ Infusi Digitalis ℥i, Potassii Iodidi gr. v, Ammonii Carbonatis gr. iv, Infusi Senegæ B.P. ad ℥i.] Every four hours. ℞ Liquoris Strychninæ Hydrochloridi ♏iii. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{36}$, Aquæ Destillatæ ♏v.] *Hypodermically,* every eight hours. (3) ℞ Tincturæ Strophanthi ♏x, instead of Digitalis etc. as in (1). (4) ℞ Digitalis Foliorum gr. i, Scillæ gr. i, Pilulæ Hydrargyri gr. i. [U.S.P. ℞ Pulveris Digitalis gr. i, Massæ Hydrargyri gr. i.] Three times a day, after meals.—Diffusible stimulants for the first three days (p. 303); and at any time as a matter of urgency: ℞ Spiritus Ætheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii ♏xx, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Spiritus Aetheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii Amari ♏xx, Aquæ Camphoræ ℥iss, Aquæ Destillatæ ad ℥i.] Every three hours

or as required.—For sleep, if necessary (p. 311). A variety of hypnotics in cardiac failure:—(1) ℞ Paraldehydi ʒi, Misturæ Amygdalæ ad ʒiss. [U.S.P. ℞ Paraldehydi ʒi, Emulsionis Amygdalæ ad ʒiss.] at 10 P.M. (2) ℞ Sulphonalis gr. xxv, as a very fine powder, in a cupful of hot soup, at 5 P.M. (3) ℞ Chloralamidi gr. xx, in soup, as before, at 10 P.M.—For insomnia with urgent cardiac distress (after elimination of hydrothorax, pericardial effusion, etc., as cause) (p. 311): (1) 12 leeches to sternal region. (2) ℞ Injectionis Morphinæ Hypodermicæ ♏ii, Liquoris Strychninæ Hydrochloridi ♏ii. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{10}$, Strychninæ Hydrochloratis gr. $\frac{1}{50}$, Aquæ Destillatæ ♏x.] At 10 P.M., or at once.—For præcordial distress, palpitation, dyspnœa, hæmoptysis, vomiting, etc., see pp. 278, 282, 305-308.

II. PROGRESS OF THE CASE.—(1) *After a few days (not less than three).* (*a*) *If no improvement or the reverse, with increase of dropsy and distress:* continue rest, nursing, food, stimulants, and purgatives, and diffusible stimulants and hypnotics and other palliatives. Increase the dose of digitalis or strophanthus by one-half. Or ℞ Tincturæ Digitalis ♏xv, Tincturæ Scillæ ♏xx, Spiritus Ammoniæ Aromatici ♏xxx, Infusi Senegæ ad ʒi. [U.S.P. ℞ Tincturæ Digitalis ♏xv, Extracti Scillæ Fluidi ♏iv, Spiritus Ammonii Aromatici ♏xxx, Infusi Senegæ B.P. ad ʒi.] Every four hours. ℞ Liquoris Strychninæ Hydrochloridi ♏iii. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏v.] *Hypodermically*, every eight hours. If persistently scanty urine: ℞ Caffeinæ Citratis, gr. vi, Sodii Salicylatis, gr. x. [U.S.P. ℞ Caffeinæ Citratis gr. vi, Sodii Salicylatis gr. x.] Every four hours. Puncture subcutaneous tissues, with full antiseptic precautions, whether anasarca be extreme or no.

(*b*) *If Improvement:* continue rest (return to bed), nursing, solid food, stimulants, purgatives once or twice a week, and digitalis mixture—reducing frequency from every four to every six hours. Diffusible stimulants only as matter of urgency.

(2) *When dropsy has disappeared and condition in general is relieved.*—Rest and diet continued; stimulants reduced to one-half. *Medicines.*—Purgatives only as required. Cardiac

tonics and hæmatinics (p. 313): (1) Tincturæ Digitalis ♏v, Tincturæ Ferri Perchloridi ♏x, Acidi Phosphorici Diluti ♏x, Aquæ ad ℥i. [U.S.P. ℞ Tincturæ Digitalis ♏v, Tincturæ Ferri Chloridi ♏x, Acidi Phosphorici Diluti ♏xii, Aquæ Destillatæ ad ℥i.] Three times a day immediately after meals. (2) ℞ Digitalis Foliorum gr. i, Ferri Sulphatis gr. i, Quininæ Sulphatis gr. i, Piperis Nigri gr. ss. Three times a day immediately after meals.

(3) *When dropsy has disappeared for a week and symptoms and signs are favourable:* patient may sit up on couch for one hour. Effect in inducing reappearance of dropsy to be looked for; and rest to be resumed if it return (p. 313). Other measures as before.

(4) *Thereafter:* daily increase of exercise, watching effects as in Establishment of Compensation (p. 291).

CHAPTER XII.

ACUTE BRIGHT'S DISEASE.

A STUDY of the natural history of nephritis furnishes us with many valuable illustrations of the opportunities and resources of treatment when it is based on rational principles. Ætiology and pathological anatomy afford unusually definite information of the nature of the causes at work in acute Bright's disease, and of their effects on the kidneys and the more closely associated organs. In the majority of instances spontaneous recovery will be found to occur, in the form of resolution; in other cases the evil effects of the retention of inflammatory products are unfortunately illustrated. This stage of the pathological process affords another highly instructive instance of mutual relief and recovery. The damage to the tubules and glomeruli immediately involved, and to the blood, which suffers from insufficient depuration, is functionally repaired. The cardio-vascular system comes to the assistance of the kidneys by a process, first, of accurately graduated reaction (rise of arterial tension), and then of hypertrophy; and in these two ways it affords temporary compensation for the renal inadequacy, although, it is true, at great risk and with ultimate disaster to itself. It is of these secondary or remote effects of acute nephritis, both morbid and recuperative, that some of the chief clinical phenomena of the disease are symptomatic, notably the anæmia, the dropsy, the remarkable pulse, and the disordered action and abnormal physical signs referable to the heart; and they cannot fail to teach the student once more the correct employment of clinical facts as guides to treatment.

Ætiological Indications.—*Preventive Treatment.*—The three orders of morbific causes are very clearly seen in connexion with acute nephritis. The efficient causes of it are mainly poisons — alcohol, cantharides, turpentine and other essential oils, salicylates and allied carbon-compounds, and the many organised poisons or toxins produced by pathogenetic organisms, as well as the organisms themselves, of scarlet fever, diphtheria, septicæmia, pyæmia, influenza, and drain-poison which is a peculiarly insidious and important one. The ordinary body-excreta thrown in great excess on the kidneys may have the same effect. The prevention of acute Bright's disease in the first place resolves itself into dealing with these efficient causes in many obvious ways. Of the determining causes of acute nephritis the most important appears to be chill; another is severe exercise; a third certainly is a combination of these two circumstances. Chill gives a sharp check to the cutaneous secretions, diverting both the blood and the excrementitious materials inwards on the kidneys; and if it follow immediately on severe and prolonged exertion when the blood is filled with the products of active metabolism, the strain thrown on the renal function must be enormous. This is what we see in young subjects after football and other games played in cold and damp weather. Chill is readily recognised as a determining cause after scarlet fever. Obviously the conditions which determine the occurrence of nephritis are full of practical suggestions for its prevention which will occur to the student himself. It would be an extreme and unnecessary proceeding, however, to forbid every young person to expose himself to cold or to take severe exercise occasionally in winter. We have practically only to guard the predisposed against such influences: the individual, for example, whose kidneys are already the seat of chronic nephritis, the convalescent from scarlet fever, the alcoholic, and those who have a personal or family liability to chill. But beyond these circumstances, which apply to the individual patient, it must be remembered that there exists what might be called a specific liability of the kidneys to inflammation. As compared with the other viscera they are pecularly exposed to injury. Such is their position in the

cycle of the viscera that they are expected or compelled to eliminate or to attempt to eliminate effete and poisonous substances of every kind.

A review of these causes of acute nephritis as a whole serves to teach us how many of them might be prevented by the exercise of reasonable care. In scarlet fever the matter is very much in the hands of the practitioner, excepting in mild cases where his advice is not sought or not followed and in which careless feeding and exposure so often damage the kidneys.

Remedial Treatment.—When acute nephritis has commenced and remedial treatment is being planned for it, the ætiology which we have just reviewed furnishes abundant indications of the first rank of importance. The ingestion of irritants of every kind is to be stopped, alcohol especially. Theoretically an attempt should be made to attack the organised causes of infective diseases in the blood and kidneys, but we have no specifics as yet which might not at the same time injure the kidneys, such as carbolic acid, mercury and anti-toxins. Happily it is quite in our power to control many of the other causes. We cut down the quantity of food; we order it of a kind which shall be least stimulant to the kidneys, such as milk and farinaceous dishes. As far as possible we also divert the excrementitious materials from the kidneys, by restoring the activity of the circulation and secretion in the skin by means of warmth, rest in bed, woollen clothing and warm baths; and by giving a mild hydragogue purgative daily, such as compound jalap powder.

Pathological Indications. — The pathology of acute Bright's disease is not a matter of simple damage and repair, but introduces us to a series of changes in the kidneys, blood-vessels and heart which give a special and comprehensive character to the clinical features of this affection and to its course and complications. It is necessary to trace this series in their natural order if we wish to understand the position which the practitioner occupies in treatment.

Beyond dealing with the efficient cause and other ætiological factors, we have but little control over the destructive or degenerative factor of acute Bright's disease. Various

attempts have been made to arrest it by means of specific drugs like arsenic, but without avail. There is no evidence that iron acts in this way.

A study of the conservative and constructive factor of nephritis introduces us to considerations of great interest and direct practical importance. The vascular reaction which constitutes an important element of the pathological process, and also involves the glomeruli, presents the usual indications for treatment: which may be fulfilled by rest, leeching or cupping the loins, the local application of fomentations or poultices, and irrigation of the kidneys with bland fluids given as food.

Repair might be expected *a priori* to be a promising and successful element of the constructive factor of acute nephritis. A catarrh or desquamative process within the uriniferous tubules ought to end easily, as in the bowel and bronchi, in fresh growth of the epithelial lining; and no doubt this does occur in the larger proportion of instances. But a number of circumstances unfavourable to repair very unhappily affect the kidneys more than other organs. In the first place, the kidneys get no rest. The kidneys are the scavengers of the body in great measure. They suffer accordingly. However urgent may be the need of rest they get none. It is not even possible, as far as we know, for one part of the kidney to rest from excretion, as parts of the lungs or the muscles for example rest in inflammation: necessarily both kidneys are invaded universally in acute nephritis.[1] One of the essential conditions of successful repair is nourishment; but nourishment of the kidneys again means increased work: so much so that renal disease is deliberately treated with low diet, although as being a degenerative process it demands an abundance of blood. Nor is the blood supplied to them in that state of purity which we know to be necessary for repair: a vicious circle ends in poisoning of the original seat of the disease — the kidneys themselves. In addition to these difficulties connected with the repair of renal tissue, fibrosis is found to exercise here some of its unhappy effects. Fibrosis attends acute nephritis when it is severe, as it is in a

[1] Cf. Adami, Allbutt's "System of Medicine," vol. i. p. 127.

minority of instances, and the evil consequences of contraction are presently added to those of the primary degeneration.[1] The effects of intratubular retention on the Malpighian bodies (to be presently described) are aggravated by the very similar effects of intertubular growth of a permanent and hopeless kind. The renal functions as a whole and life itself are sacrificed to the lowly or primitive object of local repair.

The kidneys are organs that very readily hypertrophy, and here at first sight there would appear to be hope of functional repair. We have no appreciable evidence, however, that this is accomplished or even attempted in acute nephritis, every portion of both organs being involved in disease, as has been seen.

Of great interest and importance to the therapeutist are the intratubal changes, which have two grave effects on the related parts with respect to removal of the products of inflammation. In the first place the catarrhal products block the water-way, raising the pressure in the Malpighian bodies; and thus directly depress excretion, even to the degree of arrest. In the second place they compress the intertubal capillary plexus, mechanically congesting the efferent vessels, glomeruli, capillaries and arteries; and thus indirectly also interfere with excretion. Hæmorrhage occurs, no doubt affording some relief, but adding blood to the materials which obstruct the tubules, and to the albumen and casts which are washed down by the scanty urine. We appreciate better here than in most of the other visceral inflammations the importance of that radical indication in the treatment of inflammation, removal of the products and relief of tension; and even more important reasons for it will appear presently. The uriniferous tubules must be cleared as rapidly as possible, and kept clear as far as possible, of the desquamated epithelium, inflammatory cells, fibrinous and other casts, and blood. To fulfil this indication—the maintenance of the free flow of urine from the first—two methods are employed in addition to measures calculated to arrest the process as a whole: simple flushing with abundance of bland urine, mainly water;

[1] Cf. Mott, Allbutt's "System of Medicine," vol. i. p. 184.

and the exhibition of alkalis. The first method is carried out with milk, which is otherwise indicated as we have seen, and is highly diuretic. Alkalis probably favour the disengagement and removal of the effete and fatty epithelium and inflammatory products; whether or no, they are represented by Sir William Roberts to be so valuable in acute nephritis that if the urine be kept alkaline the first week of the disease uræmia does not occur. The tests of success are plainly increase of the quantity of urine and the free discharge of oil-laden casts. Abundance of albumen and blood are evidences of the severity of the process, although free hæmaturia probably relieves the vascular tension.

So far we have traced the effects of interference with the secreting and circulatory functions within the kidney itself only. But they do not stop here. They work backwards on the blood and on the general circulation. This part of the disease from our point of view is best studied clinically.

Clinical Indications.—The striking clinical phenomena of acute Bright's disease — the anæmia, debility, dropsy, urinary disturbances, hæmorrhages, cardio-vascular changes, uræmic threatenings and local distress—can now be referred without difficulty to the different factors of the pathological process in which they originate. Each of them is full of significance, and may be employed intelligently as a guide to treatment. The value of this interpretation is peculiarly great in connexion with nephritis. The clinical phenomena are evidences of pathological events and processes of capital importance, conservative as well as destructive, which must be clearly discriminated; and they will be discussed most profitably in their natural order as guides to treatment. At the same time we shall find that some of them require direct therapeutical attention: to relieve distress, to remove disorder, and particularly to avert death.

The pathological disturbances in the kidneys which we have just traced in acute nephritis both impoverish and poison the blood. Anæmia, debility and dropsy are the evidences of poverty; uræmia is the chief evidence of poisoning. The indications correspond. Whilst the primary end to secure is relief of the obstruction in the kidneys, the blood has to be

cautiously restored in value, and continually purified by the other organs of elimination, particularly the bowels and skin. It is on these principles that two measures of established value are employed in what is commonly called acute renal dropsy: on the one hand, iron; on the other hand, hot-water baths, vapour baths or hot-air baths, and a regular daily purgative.

The remote effects of acute renal disease are not confined to the blood. High pulse tension, thickening of the arterial walls which presently may become associated with it, and cardiac enlargement originating in the increased peripheral resistance are the most important clinical phenomena connected with the circulation which are developed in the course of nephritis. It is unreasonable and unnecessary to conclude that the rise of tension and its cardio-vascular consequences are referable solely and directly to mechanical obstruction in the kidneys. As we shall see more fully in our study of Chronic Bright's Disease, the increase of excrementitious material in the blood is calculated to have the same effect, whether by acting immediately on the vascular and cardiac walls or by stimulating the vaso-motor centre. This element of the process is purely conservative, for the effect of it is diuresis. It is an instance of an effort at increased reaction, adapted to the end of increased elimination. Be the *modus operandi* what it may, the facts are patent: acute renal disease produces cardio-vascular disturbances which compensate for the disability of the kidneys.

When this condition is further developed in the subacute course which the disease occasionally follows, one or more of four events may happen. First, the increased pressure may spend itself forwards (the direction of its strictly physiological significance), by effecting an increased flow of urine and a clearance of the impacted tubules. Acute nephritis happily ends in this way in a considerable percentage of cases— with free diuresis and discharge of casts and *débris*. Second, the tension may spend itself laterally, as it were, by rupturing the vessels. Hæmorrhage is the result—from the nose or other mucous tract, into the retina, or into other parts. This is a highly critical and happily a rare development. Or, thirdly,

the blood-pressure may tell so heavily backwards on the heart that the left ventricle, its myocardium being fed with poor and poisoned blood, fails to complete its systolic emptying and residual dilatation ensues, ending most likely in speedy death.[1] The last of the four events is fortunately more common than the two preceding ones: the heart still enjoys the conditions necessary for the display of increased work, responds successfully to the strain, and hypertrophies. A state of compensation is thus established: the powerful heart and the associated high pressure in the vessels serve to effect a sufficient flow of urine to maintain life at least. The position of the patient is however very precarious. The new adjustment is at a dangerously high level, as the occurrence of headache, cerebral confusion, hæmorrhages, and possibly convulsions and other uræmic symptoms testifies. After a certain period, also, that is if acute drift into chronic nephritis, this compensation may break down. The hypertrophy fails, residual dilatation progresses, and the patient may perish either speedily or with the familiar symptoms and signs of cardiac dropsy.

The indications for the management of all these cardio-vascular changes and events in nephritis hang together and must be considered together. The radical indication is of course to clear away the obstruction in the kidneys, which is very difficult of accomplishment, excepting to the degree which we have already seen. The second indication, which can be fulfilled both certainly and expeditiously, is to lower the arterial pressure by bleeding, leeching, the use of vaso-dilator drugs, or best of all by means of a brisk hydragogue purgative, which depurates and drains the blood and can be repeated safely as required. At the same time a faithful watch must be kept on the action of the heart. We have abundant means of estimating this in the symptoms and in the signs: the impulse, first sound, second sound, murmurs, pulse, mechanical congestion and dropsy. The indication is one of the most difficult in the whole range of medicine to fulfil with accuracy and success: to maintain a sufficient but not excessive display

[1] Barlow, *Med. Times and Gaz.*, London, 1880, vol. i. p. 426. Goodhart, "Acute Dilatation of the Heart as a Cause of Death in Scarlatinal Dropsy," *Guy's Hosp. Rep.*, London, 1889, 3rd series, vol. xxiv. p. 153.

of cardiac force, keeping before us the respective perils of the two extremes, excessive tension and cardiac failure. At one time a short course of cardio-vascular tonics like digitalis, nux vomica and iron will be called for by falling off of the tension, œdema, or signs of dilatation of the heart; at another time free use must be made of aperient salines and potassium iodide; and diet and exercise will have to be varied correspondingly. It would be impossible to carry out the system practically were our attention not directed at the same time to control of the blood-pressure as just described.

It is at this point that the further indications relating to *nourishment* in acute nephritis can be discussed most profitably. We have already seen that the causation of the disease and the active hyperæmia, repair, and retention of inflammatory products in the kidneys call for milk diet. The anæmia, dropsy and high tension all suggest the same kind of food—food that is not only nutritious but diuretic. Milk can also be taken during the febrile process when other food could not be taken and certainly not digested. More than one disquieting circumstance, however, connected with milk diet occurs to us in framing our plans: that milk is highly constipating; that it very readily deranges the liver and causes gouty symptoms in some subjects; that it is not calculated to establish or maintain a high degree of cardiac hypertrophy; and that it is a monotonous unattractive food which the patient presently comes to loathe when it is presented to him at regular short intervals for weeks on end. The practitioner must therefore exercise judgment in dieting his patient, guiding himself by urine, headache, pulse and heart, as well as by other obvious circumstances, and turning to other kinds of food than milk when advisable, such as farinaceous materials, dressed vegetables, fruits, fish and the lighter forms of meat, and yolk of egg. As improvement continues, a little more meat should be allowed and its effects noted. Half-cooked kidney appears to benefit some cases, perhaps by supplying the want of internal secretion. Water, particularly distilled water, should be allowed freely along with the solids. Even when the diet is strictly confined to milk, it may be varied extensively in form and flavour with little trouble—milk

natural, milk boiled, milk allowed to stand on bread and strained or thickened with arrowroot, milk with a flavour of tea or of coffee, simple junket, butter-milk, koumiss, occasionally a little white soup, occasionally a little baked custard, and so on. Alcohol must be strictly avoided, as we have seen, in routine practice; but there are conditions of circulation in which it may be demanded as a matter of emergency.

INDICATIONS FROM THE COURSE.—Although acute in its onset, this disease runs an indefinite and often protracted course, with many possible complications of a grave kind and occasional recrudescences. Two-thirds of the cases end in complete recovery; the rest perish or drift into chronic Bright's disease, itself essentially fatal. Death usually results from complications—acute inflammation of the lungs, pleura or pericardium; from uræmia; or by exhaustion and dropsy.

This is the prospect before us when called upon to treat acute nephritis. The result is an open one. Intelligence and judgment will be demanded throughout, and, equally with these, special watchfulness and preparedness for complications, and unfailing patience and perseverance. Few diseases called acute become more often stagnant and discouraging in their course than nephritis. For weeks or months we may have to be content with little or no improvement, provided we save the patient from relapse and grave complications; but this position the patient and his friends cannot be expected to understand, and they require careful management to prevent discontent or despair. The period of control has further to be lengthened because the termination that is being worked for is not simple recovery but complete recovery; the danger of drifting into chronic Bright's disease being averted by thoroughness and strictness of treatment in every detail.

The complications of acute nephritis have been noticed incidentally, particularly with respect to the prevention of them. The indications for the treatment of them individually will be discussed in connexion with chronic Bright's disease (p. 341).

During convalescence, care must not be relaxed. The indications remain: to insure comparative rest of the body as

a whole and of the kidneys in particular; to protect the surface from chills; to promote elimination by the skin and bowels; and to restore the blood and the tissues by carefully selected food of more generous character and tonic medicines. Change to a mild climate is invaluable at this stage. In a word, the convalescent from scarlatinal nephritis should be treated some months for threatening chronic Bright's disease. For years afterwards, possibly for the whole of his life, a person who has suffered and recovered from nephritis will be wise to regard himself as delicate and to adhere to these principles. He should habituate himself to a spare diet: attend to his skin with scrupulous care, in respect both of the tepid soap bath and of clothing; avoid violent exertion, such as football; and abjure alcohol entirely.

Outline of Practice.

I. Commencement of the Case.—*General Management and Nursing.*—Rest in bed, in a room at not less than 60° F.; flannel garments, blankets, no sheets; careful nursing. Warm baths: never cold. If lumbar pain, free hæmaturia and scanty urine: a hot water bag to loins; or dry-cup (p. 321). *Diet:* Milk only, or milk and water. *Medicines:* A regular morning purgative (pp. 320, 324). ℞ Potassii Tartratis Acidi ʒii, Sodæ Tartaratæ gr. xx, Tincturæ Aurantii ♏xv, Syrupi Aurantii ♏xxx, Aquæ ad ʒi. [U.S.P. ℞ Potassii Bitartratis ʒii, Sodii Tartratis gr. x, Tincturæ Aurantii Amari ♏xv, Syrupi Aurantii ♏xxx, Aquæ Destillatæ ad ʒi.] Every morning.—A saline diuretic and diaphoretic mixture: ℞ Potassii Acetatis gr. xx, Potassii Bicarbonatis gr. x, Liquoris Ammonii Acetatis ʒii, Tincturæ Limonis B.P. ♏x, Syrupi ♏xxx, Aquæ ad ʒi. Every six hours.

II. Progress of the Case.—(1) *At subsequent visits.*—(*a*) *If no complications occur*, continue general treatment and diet, but presently begin to modify them in detail. In the more severe cases: vapour or hot-air baths. If case do well, allow in addition to milk in different forms (pp. 326, 327) farinaceous foods; then in succession, light vegetables, sub-acid fruits, fish, fowl or game, fat bacon—watching the urine, pulse

and general strength. Abundance of distilled water or Vichy, or imperial drink with the solid meals (p. 326): ℞ Potassii Tartratis Acidi ʒv, Syrupi q. s., Aquæ bullientis Oi. [U.S.P. ℞ Potassii Bitartratis ʒv, Syrupi q. s. Aquæ bullientis Oi.] To be drunk *ad lib.* No stimulants.—Very gradual cautious return to sitting up and movement. *Medicines.*—A mild, unstimulating, hæmatinic and diuretic mixture (p. 324): ℞ Ferri et Ammonii Citratis gr. v, Potassii Citratis gr. xv, Tincturæ Scillæ ♏v, Spiritus Ætheris Nitrosi ♏xxx, Syrupi Aurantii ♏xxx, Aquæ ad ℥i. [U.S.P. ℞ Ferri et Ammonii Citratis gr. v, Potassii Citratis gr. xv, Extracti Scillæ Fluidi, ♏i, Spiritus Aetheris Nitrosi ♏xxx, Syrupi Aurantii ♏xxx, Aquæ Destillatæ ad ℥i.] Three times a day after meals. A regular morning purgative: ℞ Sodii Sulphatis Effervescentis B.P. gr. 120, Aquæ calidæ ℥viii.

(*b*) *If complications threaten or occur,* including serous dropsies, excessive vascular tension, uræmia, or secondary inflammation: employ appropriate treatment, in respect of general management, diet, and drugs. See Chronic Bright's Disease (p. 347).

(2) *Convalescence.*—Extreme care in general management (page 327). Warmth indoors; warm woollen garments on getting out; change to a mild climate—on the coast or inland. Exercise at first passive only. Daily evacuation of bowels, Diet nutritious, but moderate in quantity, with relative excess of fats and farinaceous elements. No alcohol. *Medicines.*—A stronger hæmatinic mixture: ℞ Tincturæ Ferri Perchloridi ♏x, Tincturæ Digitalis ♏v, Spiritus Juniperi ♏x, Glycerini ♏xxx, Aquæ ad ℥i. [U.S.P. ℞ Tincturæ Ferri Chloridi ♏x, Tincturæ Digitalis ♏v, Spiritus Juniperi ♏x, Glycerini ♏xxx, Aquæ Destillatæ ad ℥i.] Three times a day after meals.

(3) *Permanent care of health.* Avoid all the recognised causes of chronic nephritis (see p. 328).

CHAPTER XIII.

CHRONIC BRIGHT'S DISEASE.

It might be said with truth that the complex pathological state known as chronic Bright's disease illustrates every principle of treatment which has been discussed in the first part of this treatise. Extrinsic and intrinsic poisons will be found to have been at work as causes in a large number of instances, but the very promising indications suggested by this simple order of pathogenetic influences unhappily are too late for useful fulfilment. The pathological processes within the kidney itself, partly degenerative, partly inflammatory, also furnish highly instructive instances of rational indications; but again we find that few of them can be directly turned to practical account. Fortunately, however, there proves to be associated with chronic nephritis the same means of natural relief from its effects as we meet with in acute Bright's disease, in the form of accurately graduated reaction of the arterial and cardiac mechanisms to the disability of the kidneys, and subsequent hypertrophy. We shall find that this conservative provision presents all the interesting features of compensation which we have had occasion to study from a general point of view—the origin and necessary conditions of successful hypertrophy, the limits of its usefulness, its incidental dangers and other drawbacks, and its ultimate failure. An opportunity will thus be afforded us of appreciating the many occasions that may occur to the practitioner of managing a grave disease with considerable success in spite of the hopeless features of its local pathology. We may also expect to have brought home to us how different a disease in

the full meaning of the term is from the simple pathological changes in the organ originally affected; how careful one must be in drawing therapeutical indications from individual symptoms; and how extensive and many-sided the treatment may be that is rationally calculated to be of service.

ÆTIOLOGICAL INDICATIONS.—*Preventive Treatment.* The prevention of chronic Bright's disease is recognised as part of the practical management of scarlet fever and other acute specific diseases, digestive and hepatic disorders, gout, gravel, and those chronic inflammatory affections of bones, lungs, etc., in which lardaceous degeneration originates. We have discussed in the preceding chapter the prevention and treatment of Acute Nephritis, and it is from acute nephritis that the large white kidney usually proceeds; convalescence having to be conducted with particular care (p. 327). Uric acid, lead and alcohol are the poisons in which granular kidney arises, as well as from an excess of the products of free living and laborious anxious occupations, or of the two combined. Chronic Bright's disease would be less common were these causal relations less insidious. Improved surgical treatment unquestionably prevents many cases of lardaceous disease.

Remedial Treatment.—Although chronic Bright's disease is thoroughly established, as its name implies, by the time it comes under the care of the practitioner, there are still indications for dealing with its recognised causes. It is a fact that the lardaceous form, if it have not advanced far, may actually be remedied by removal of the primary disease in which it has originated. We cannot pretend to deal so successfully from the ætiological side, nor from any side, with the large white kidney and the granular kidney. But it is undeniable that drain-poison, alcohol, lead, cold, damp, hard work and hard and free living, large eating, gout—one and all—aggravate, just as they originate, chronic nephritis. The indication is perfectly clear: to remove, forbid or otherwise deal with these and other causes as often and as far as we have opportunity. The subject of parenchymatous nephritis, therefore, must be directed to dress in warm woollen garments; to have his bath always tepid; to avoid unfavourable weather; and if he can afford it, to winter in a mild equable climate. At the

same time he is to reduce the nitrogenous waste of metabolism by living on a spare and simple diet, including milk, fish, a limited amount of meat, farinaceous materials, light vegetables, and a full supply of hydrocarbons in the form of fats. Alcohol is to be forbidden. Comparative rest will also reduce the amount of poisons of intrinsic origin which fall naturally upon the kidneys, demanding elimination. In the case of the patient with granular kidney, who is often the subject of irregular or regular gout, the instructions on the subject of spare living and abstinence from alcohol must be given definitely, and observed consistently in the face of the temptations to which he may be exposed both by disposition and circumstances. We shall presently find that under certain conditions the diet may have to be modified; and at no time in this form of Bright's disease, as we shall also find, is milk so suitable a food as in tubal nephritis. But when the necessity arises for more generous diet, this should be allowed, as we shall see presently, although still in the form chiefly of carbohydrates and hydrocarbons.

Pathological Indications.—In our comparative ignorance of the intimate pathology of chronic Bright's disease we have to content ourselves with ascertaining the plain indications afforded, first, by the local lesions in the kidney itself, and, secondly, by the remarkable series of changes associated with renal disease to be found in the cardio-vascular system.

The morbid processes of degeneration and fibrosis are to be arrested if possible. This end is calculated to be promoted, but cannot be said to be practically attained, by securing the moderate degree of functional rest for the kidneys which the necessities of nutrition and elimination will permit, and by the exhibition of such drugs as arsenic and iron with all the precautions necessary under the circumstances. We have discussed this subject at some length in connexion with acute Bright's disease, p. 321. Whilst the destructive factor of the pathological process is being thus controlled, repair ought to be promoted if we possess the means of doing so with safety. In the kidney, as in other organs, the process of healing is dependent on an abundant supply of well-nourished and well-cleansed blood, that is, ultimately on a generous and nutritious diet,

which we have just seen to be contra-indicated, and on active elimination, carried on by those very organs, with others, which it is desirable to rest, to relieve, and to repair. We discover here a clashing of indications which no doubt in part accounts for the small amount of success which attends the treatment of chronic nephritis; and which has led to great diversity of opinion amongst the recognised authorities on this subject, as to the relative advantages of nitrogenous and non-nitrogenous diet in Bright's disease. The outcome of these considerations would appear to be that no hard and fast rule can or ought to be laid down on the subject, and that each case individually and in its different phases demands the exercise of discrimination and judgment, based on as accurate an estimate as can be made of the condition and capacity of the kidneys, the state of the circulation and the activity of the other excretory organs, and on intelligent observation of the immediate effects of treatment on the urine, pulse and nervous system. One thing is clear, namely, that when generous diet is ordered, in the shape of meat, the strictest attention must be paid to the action of the bowels and skin; so that whilst material for repair is poured into the blood, the waste-products may be thoroughly eliminated, and eliminated by other channels than the damaged organs. A relative excess of fats and amyloids may be the best constituents of diet in chronic Bright's disease in respect of the production of work and heat in patients still able to follow light occupations in the open air; and an allowance of fat, in the form of bacon, for example, or of cold meat with a minimum of lean, gives them a grateful sense of satisfaction and support which are sorely missed and complained of by patients on "non-nitrogenous" diet. It is doubtful, however, whether carbohydrates and hydrocarbons are of much account in repairing damaged tissues, as compared with nitrogenous materials. Milk holds a high place in the estimation of the profession at present as an article of diet in the large white kidney, when it is given instead of meat—not in addition to meat or along with it as a beverage. It is highly nutritious; may be taken in large quantities as a rule; appears to yield products that are less irritant to the kidneys than those of

meat; and insures the safe elimination of these by being a diuretic. We shall return to the subject of diet presently.

The unquestionable value of milk in chronic Bright's disease and its powerful diuretic action introduce us to the third indication which we discover by a study of the morbid anatomy of the kidney, namely, removal of the products of the disease. The highly watery urine secreted on a milk diet flushes the tubules which are choked with degenerate epithelium, leucocytes and casts, blocking the water-way and mechanically interfering with the circulation through the plexus of intertubal capillaries. A similar clearance is probably made of the *débris* lying within the Malpighian capsules, compressing the glomerulus like a lung in empyema, and threatening it with permanent condensation and atrophy. Removal of the products by means of diuresis thus relieves at one and the same time the urinary channel and the venous, capillary and arterial structures by which an important part of the function of excretion is effected. This must not only promote local repair, but have a beneficial effect in preventing poisoning of the blood by retention very similar to that which is secured by drainage of an abscess. The particular form of Bright's disease in which milk is acknowledged to be valuable is, as we should have expected, the large white kidney or chronic tubal nephritis; and for the reasons just given and also discussed under the head of Acute Bright's Disease. Other diuretic measures appear to be successful in chronic tubal nephritis, such as the citrate and acetate of potassium, which are often given in combination with iron as a hæmatinic. In the granular kidney milk is not successful; nor indeed is it indicated. Here there are no or very few intratubal products to be removed, but an interstitial fibroid growth which ruins the secretory and vascular structures by extrinsic pressure. Here indeed diuresis is already present, as we shall presently see; and gout is readily induced by the free use of milk. No means can be said to be yet at our disposal to remove the products of interstitial nephritis. Potassium iodide and mercury may have had this effect amongst others in some cases where they appear at least to have been given with benefit.

It would be useless and indeed irrational to discuss patho-

logical indications for the removal of amyloid material from the kidney in the form of Bright's disease which bears its name. We possess no means of doing so, and if we did, the degeneration would proceed as long as the obvious cause remained at work within the body.

The cardio-vascular changes are the most suggestive of the pathological characters of chronic Bright's disease, next to the renal lesions of which they prove to be the complement in the morbid process regarded as a whole. The arterial walls are thickened from increase both of their connective tissues and of the muscular elements; and the coronary arteries suffer with the rest. The left ventricle is at first simply and purely hypertrophied; later on, the nutrition of the myocardium becomes impaired, and residual dilatation sets in, with evidence of consecutive failure of the right side of the heart, mechanical congestion of the viscera including the kidneys, and dropsy of cardiac type. Cerebral hæmorrhage proves to have been the immediate cause of death in a number of cases. In other instances profound anæmia and dropsy of renal type are found *post mortem*, by far most frequently in association with the large white kidney; but this form of chronic renal disease more often proceeds to atrophy and fibrosis, with involvement of the vascular system and heart. The significance of these pathological changes beyond or outside the kidney itself from the therapeutic point of view is more easily described and appreciated in connexion with the clinical phenomena and course of Bright's disease; and it is by these that treatment —in practice and partly in theory—must be finally regulated. We pass on therefore to study them under the next head.

Clinical Indications.—The different clinical phenomena of Bright's disease present a variety of meanings, and would be dangerous guides if accepted as direct indications for "symptomatic" or palliative treatment without due interpretation. Some are manifestations of the destructive process of degeneration in kidneys, blood and vessels, such as debility, wasting, vomiting, anæmia and renal dropsy. Others are evidences of the effort at compensation which is being made by the heart and vessels, including the physical signs of hypertrophy, the characters of the pulse, and the polyuria. And

some of the symptoms like headache and cerebral hæmorrhage have to be regarded as unfortunate effects of this conservative provision. These illustrations show how cautiously a practitioner must employ his clinical observations. Their physiological relations as well as the pathological process in which they originate must first be investigated, and—as far as is possible with our present knowledge—understood.

The indications furnished by the changes in the urine correspond with those which we have already discovered in association with the different pathological forms of Bright's disease. In the large white kidney the diminished urine, high specific gravity, abundant albumen and presence of casts point to the necessity for diuretics; in the granular kidney the excessive flow of pale light urine, with little or no albumen and few if any casts, proves that there is no block within the tubules to be cleared away, but that, on the other hand, excretion is being carried on under abnormally high pressure, a conclusion obviously full of therapeutic suggestion if it can be turned to practical account.

Of the other morbid characters of the urine the one which is appreciated most readily and to which most importance is attached by some practitioners is albuminuria. The indications furnished by albuminuria are still symptomatic only. It is to be regarded solely as significant of a pathological state. It does not call for direct treatment. Patients do not die of albuminuria; it is doubtful whether they suffer much in direct consequence of the drain of serum through the kidneys. Attempts made to reduce albuminuria by drugs, whilst quite intelligible and estimable, are therefore unnecessary and not to be recommended. Besides, they divert attention from far more important characters of the urine in Bright's disease, its volume and the deficiency of urea; and as a matter of fact they have hitherto proved vain—indeed there are few morbid conditions of a plain simple kind that more distinctly refuse to yield to drugs than albuminuria. Yet this symptom is not to be despised by the therapeutist. On the contrary, it is to be regarded faithfully as an index of the pathological changes, and thus as an indirect guide to treatment of most valuable and readily available description, the amount of albumen in some

instances varying definitely with the actions of rest and diet and the use of certain drugs on the kidneys and circulation.[1]

Between the secretion from the diseased kidney and the blood-pressure, however, there comes the blood itself, which must be next considered. The anæmia and debility of Bright's disease point to the necessity for attention to the blood; and the dyspnœa and dropsy are in part evidences in the same direction. The blood is both impoverished and poisoned by chronic renal disease and its causes, as it is by acute nephritis; and an effort must be made to remedy it in both respects. Here we find a fresh indication for the employment of a carefully balanced diet; of iron, of arsenic or allied drugs; and of elimination by other channels than the inadequate kidneys.

We are now in a position to consider the phenomena of high tension within the cardio-vascular system, one of the chief problems in the practical management of chronic Bright's disease. For our present purpose we may safely accept the following view of the pathology of the high blood-pressure which we studied in more detail in the last chapter:—The accumulation of excrementitious materials in the blood consequent on defective elimination and the original causes of the kidney disease themselves, such as hard work and free living, acts on the vasomotor system and vessels, and causes active contraction and ultimately thickening of the arterial walls. The increased peripheral resistance produced in this way and by the mechanical block in the kidneys, and very probably the morbid condition of the blood itself as well, stimulate the left ventricle, which proceeds to hypertrophy. The high blood-pressure thus established between the central heart and the peripheral resistance effects compensation for the renal inadequacy by a greatly increased flow of urine; which, although watery, may carry with it an actual excess of urea in the course of twenty-four hours. Meanwhile the maintenance of the high blood-pressure, conservative though it be, is both costly and dangerous. It often produces headache, nausea, vertigo and other symptoms of circulatory disturbance; and it may lead finally by an unhappy mode of relief to rupture of the strained and diseased vessels, particularly those of the brain.

[1] Sparks and Bruce, *Med.-Chir. Trans.*, London, vol. lxii. pp. 243-268.

When we carefully regard the different factors of this remarkable process as an attempt at natural relief and recovery often ending in disaster, the position which we ought to attempt to assume in the management of Bright's disease becomes obvious. We have to try to restore the normal amount of elimination from the blood (which is the object of the high pressure) without taxing the circulation to a dangerous extent: without necessitating the patient to live in so hazardous a condition as a bursting blood-pressure. Theoretically this end would be attained: by reducing the ingesta, the mechanical strain on the circulation, and metabolic waste; by opening other channels of excretion, particularly the bowels and skin; and by increasing the activity of the renal tissue that remains healthy, and removing intratubal block when it is present. It thus appears once more that in Bright's disease the food has to be most carefully planned with respect to both quantity and kind, alcoholic stimulants of the heart and vessels being at the same time excluded. Work will have to be cut down. The skin must be kept in a state of the highest efficiency, and attention to this indication may involve wintering in a mild climate. Above all, a free daily evacuation of the bowels must be insisted on, as being not only effective but thoroughly practicable. Mild courses of diuretic drugs are also indicated, variously combined with other remedies which have to be ordered, such as hæmatinics, absorbents and laxatives. The occurrence of headache, nausea, epistaxis or marked increase in the tension of the pulse will demand a sharp purge and low diet for a few days. With these measures will be combined the use of potassium iodide or of a nitrite. It is true that these drugs reduce the high blood-pressure without removing its cause, but they do so quickly and certainly whilst the more radical means are coming into play. In former times venesection was practised under these circumstances, and probably wisely, for it is plainly indicated when the condition becomes extreme. An important indication in this relation is to safeguard the organs which are known to be the favourite seats of hæmorrhage from high pressure and vascular degeneration, as well as of nutritive failure and consequent functional disorder. The brain and the retina have to be specially preserved

from damage. Comparative rest is obviously the most effectual means of securing this end, in addition to the management of the disease as a whole. The patient must be cautioned against the ordinary causes which determine vascular rupture, such as sudden muscular strain and excitement; and the employment of the eyes in reading may have to be forbidden. Hæmoptysis, epistaxis, hæmatemesis or melæna, occurring in this connexion, calls for corresponding treatment. Grave harm has been done in some instances of bleeding from the lungs by regarding it as necessarily of tuberculous origin and dealing with it accordingly.

A great difficulty in the management of chronic Bright's disease is the maintenance of the heart. The heavy and persistent demands for work made upon it by the increased peripheral resistance, the disordered blood, and the diseased state of the coronary vessels, as well as the many possible causes of interference with the nervo-muscular structures of the hypertrophied heart more familiar to us in valvular disease, combine to induce cardiac failure, as evidenced by præcordial anxiety, palpitation, *bruit de galop*, dyspnœa, œdema of the feet and presently the other phenomena of mechanical congestion. Under these circumstances the means of lowering the blood-pressure just discussed must be actively practised, in spite of the cardiac depression which temporarily attends such powerful measures as purgation and sweating. But the heart itself is calling for direct as well as indirect help when such symptoms as the above begin to make their appearance. Compensation must be maintained, and restored if it have failed. Digitalis, nux vomica and other cardiac stimulants and tonics are now indicated in combination, for example, with potassium iodide, as well as a more generous diet, rest, and the other means of treatment described in the sections on failure of the heart with valvular disease (p. 296).

The dropsy of nephritis calls for therapeutical attention from two sides. In the first place, an attempt is made to treat it remedially, by means directed to the physiological disturbance of which it is a manifestation; in the second place, when it becomes urgent it demands purely palliative treatment—to relieve the distress and disorder or possibly to avert the danger

which it entails. The remedial treatment of true renal dropsy as distinguished from the dropsy of cardiac type and cardiac origin which often supervenes in the last stage, is one of the *opprobria medendi*. We are still ignorant of its pathogeny when it takes its characteristic form of general anasarca, with or without serous effusions. All that is usually done is to trust to the remedies given in fulfilment of other indications, and as far as these permit to employ measures calculated to improve the blood, and the vigour of the heart and circulation as a whole. Quite recently Dr. William Ewart has propounded a novel and attractive view of renal dropsy and its rational treatment.[1] He proposes to unblock the lymphatic ways which are choked by œdema, to establish a thorough flow from the blood into the lymphatics, and to quicken the lymphatic circulation, by allowing the œdema to collect on the lower limbs (by slanting the bed) and then incising or puncturing and draining. When the œdema is thus being relieved, another channel of relief is afforded to the ingesta, and now a more varied and sustaining diet can be presented. Thus the patient may soon be able to sit up; and drugs and stimulants may be given with safety and with better results. Meanwhile massage would be used for the parts that are freed from œdema. The palliative treatment of dropsy in Bright's disease consists in the employment of purgatives, diuretics and diaphoretics as already discussed; and in the timely relief of serous accumulations by means of paracentesis or puncture.

Let us now attempt to settle the very difficult question of *diet* in chronic Bright's disease. We have seen that it is involved in the great problems of repairing and yet not overtaxing the kidneys, of sustaining and yet not poisoning the blood, of preserving the blood-pressure at a sufficiently high but not dangerous height, and of maintaining the compensatory hypertrophy of the heart. We need not wonder if the diet in a disease of such variety of form and phase have been a subject of much divergence of opinion and repeated discussion. The guiding principle is to hold a delicate balance, and to throw in a weight or remove one on either side as disturbances may

[1] *Proc. Roy. Med.-Chir. Soc. London*, new ser. vol. x. pp. 160-180; and *Brit. Med. Journ.* 1898, vol. ii. p. 18.

demand. There can be no question but that in the graver phases of the disease, particularly uræmia, disposal of the food or its products is a more important consideration than nutrition. The imminent danger is from relative excess, not from deficiency. But it is also certain that this consideration can be and often has been pushed too far, particularly in quiescent Bright's disease. Strictness of dieting has been excessive. Patients may have suffered and died of cardiac failure from being deprived of nitrogenous food. The primary indication connected with food and feeding under all circumstances, namely nutrition, has been forgotten, and also the further indication for food as a means of repair and hypertrophy.[1] The order of importance of the indications fulfilled by diet in Bright's disease may be thus represented: (1) Food to be of such quantity and kind that the nitrogenous in-take shall not strain the capacity of the eliminating organs, particularly the kidneys, whilst supplying the metabolic demands of the body and promoting repair. Therefore caution in the use of meats and meat-preparations and of alcohol: relative excess of fish, milk, fats, watery solids, farinaceous materials, vegetables and fruits. (2) Food to be digestible in the widest sense, so that it cause no disturbance in stomach, intestine or liver, which would oppress the heart, increase uric acid and raise the vascular tension. (3) Food to present sufficient variety and bulk to be attractive. Milk to be cooked in different forms (see page 326); vegetables to be dressed; farinas presented in new combinations, etc.; fats presented as yolk of egg, crisp hot bacon, cold boiled ham, etc. (4) The practitioner to be bound by no routine or inflexible rule or regimen: the more nearly the diet approaches that of health (without inducing disorder) the better; and the effects of different foods in each case and in the different phases of each case to be intelligently observed and employed as guides to treatment.

Complications.—Secondary congestions and inflammations of the lungs and serous cavities, which are so often the immediate cause or form of death, must be met by measures directed to the local as well as to the primary or fundamental conditions, particularly leeching, dry and wet cupping and counter-irrita-

[1] Hale White, *Med.-Chir. Trans.*, London, vol. lxxii. p. 301.

tion. Every possible precaution should be observed during the course of Bright's disease to protect the parts which are liable to these grave involvements, particularly from functional strain and chill.

Uræmia.—Whatever its cause and whatever its phenomena, uræmia is in itself one great morbid state and must be treated with promptness as well as with thoroughness. The broad principles which guide us are: (1) to relieve urgent disorder and distress and avert danger by measures which have an immediate action—palliative treatment; and (2) to reach the causes of uræmia, the retention of poisonous materials in the blood, if not the pathological changes in which this originates, by measures of a more radical character but necessarily less rapid in their effects—remedial treatment.

Palliative treatment is employed in many different forms. Convulsion calls for personal assistance and attention to the tongue. If it be repeated, chloroform is administered, or a hypodermic injection of morphine. Coma calls directly for ordinary attention only, including lateral cubitus. In the delirium and terrible restlessness of uræmia morphine hypodermically, even the small dose of $\frac{1}{16}$th of a grain, is invaluable; and hyoscine sometimes secures temporary quiet. For vomiting consideration has to be given first to the ingesta. Food should be withheld entirely for a time, and water only given, sometimes in an effervescent form with a little spirit when the pulse is very low, or as iced water taken through a glass tube; thereafter koumiss or peptonised milk may be tried in teaspoonfuls or tablespoonfuls, or enemata of peptonised milk. By way of medicines, diluted prussic acid, creosote, tincture of iodine in water or nitroglycerin answers in different instances of uræmic vomiting, whilst epigastric applications are also employed. Rest is of course essential, and is usually insured by the prostrate condition of the patient. The ordinary morning headache of chronic nephritis yields quickly to a cup of hot tea. In fully developed uræmia headache is usually associated with sickness and relieved along with it. Nitroglycerin, potassium bicarbonate in effervescence, caffeine as such, and in other instances acids[1] afford

[1] Ralfe, "Diseases of Kidney," 1885, p. 268.

relief, and so do local applications of heat or cold to the head. Diarrhœa is best left alone as a rule, but may be so severe as to demand arrest by means of astringents or even of opium cautiously employed. "Uræmic" dyspnœa is of several types —renal, cardiac and pulmonary—and must be treated accordingly; but Cheyne-Stokes respiration and even orthopnœa of the most severe character, with physical signs of extensive pulmonary œdema, not infrequently pass off spontaneously and as unexpectedly as they came. The nitrites may be employed in these conditions. Wet-cupping sometimes gives great relief in urgent pulmonary congestion or œdema.

Remedial treatment is intended to have a direct and radical influence upon the chemical or structural changes in which uræmia originates. Venesection is practised in exceptional cases, for example when convulsions are persistent as well as severe; in women *post partum*;[1] when the arterial tension is excessive; and in strong subjects with very chronic nephritis who have developed uræmia from acute renal congestion due to free living and exposure to cold. The question should be raised in every instance of uræmia whether the condition be not due to some temporary disturbance rather than to absolute failure of the kidneys. More ordinarily the remedial measures employed are less extreme, and belong to three different orders —diaphoretics, purgatives and diuretics. All are powerful and all are valuable, but they are available in different respects. In order of rapidity of action we have: diaphoretics, purgatives, diuretics; in order of certainty of action: purgatives, diaphoretics, diuretics; in order of directness of action on the pathological causes of uræmia: diuretics, diaphoretics, purgatives. The practical rule to follow therefore is to employ diaphoretics, medicinal and non-medicinal, such as pilocarpine and hot air or vapour baths, in response to the present urgency of the symptoms; to order a smart purgative at once, croton oil for example, as well as the daily aperient; and to prescribe a diuretic combination, which is to be given every few hours, of a kind that shall not irritate the kidneys, that controls the blood-pressure according to the indications present, and that may be expected to come into play after

[1] Grainger Stewart, Quain's "Dictionary of Medicine," 1895, vol. i. p. 243, col. ii.

some hours or possibly some days, potassium acetate and iodide with digitalis being most useful in these respects.

INDICATIONS FROM COURSE.—The management of chronic Bright's disease throughout its course involves the intelligent control of a vast series of conditions, circumstances and measures. The progress of the disease is uncertain, being different in different instances; variable from day to day, or even hour to hour, in any given case; filled with complications, of every kind, of every possible relation to each other and to the original disease, mostly of serious import, and of sudden unexpected development. The practitioner cannot always cope with a condition of this protean character, oppressed as he is at the same time with the knowledge that the disease is essentially progressive and will terminate fatally at an early date, either suddenly or slowly. But he can prolong life; he may be able to avert death when it appears to be imminent by vomiting, convulsions, cardiac failure, pulmonary congestion or serous inflammation; and he will sometimes succeed in re-establishing physiological compensation for a considerable length of time just when the outlook appears most hopeless. In comparatively mild cases, or during the periods of quiescence in the pathological process which occasionally occur, it will be our first concern to maintain the elementary functions, at least, on the new balance. Then a cautious trial may be made of specific, tonic and other remedies such as arsenic, potassium iodide or iron. Return to or increase of work and a rather more liberal diet will certainly be suggested by the patient, and may be conditionally permitted, the effect being watched on the urine and pulse, and the patient himself being directed to retrace his steps in both directions if morning headache, nausea or præcordial distress makes its appearance. In this connexion it is important to recognise the relative importance of the ordinary symptoms of Bright's disease as guides to treatment. An unnecessary amount of anxiety and thought and drugging has no doubt been devoted to the albuminuria, which, as we have seen, rarely calls for direct treatment, and is little amenable to any measures—of a medicinal kind at least—that we can employ. Above all, the details of treatment, the attention devoted to individual symptoms, and

the management of complications must all be in strict conformity with the great principles founded on the pathogeny of the disease which we have accepted as our guides. A severe attack of epistaxis, ending in anæmia, must not distract us from the dangers of recurrence of high tension. A period of persistent vomiting and precarious alimentation must not tempt us to over-feed the patient when it ends. Under circumstances of this kind, we shall do well to bear in mind the principal indications which we have reviewed, and which may be stated thus briefly *en résumé:* to control the causes and the pathological processes within the kidneys; to increase the activity of the other organs of elimination; to regulate food and work, in relation particularly to their metabolic products and the disposal of these; to keep a strict watch on the pulse, heart, and other means of estimating and regulating the arterial tension; to maintain the heart and vessels in a sound state, and to increase the vasomotor and cardiac forces by the use of drugs when they threaten to fail.

As the termination of the disease approaches, and death is obviously near, many modifications will be required in the plan of treatment, which need not be mentioned in detail.

Outline of Practice.

A. Parenchymatous Form.—*General Management.*—At first rest, partly or entirely indoors, often in bed; room warm but properly ventilated. Later on, sheltered drives and walks, and return to light indoor occupation. Special caution against strain of eyes and brain. Warm flannel clothing. *Weather and Climate.*—Avoid cold and damp when open-air exercise is possible. Winter on south or south-west coast of England or south of Ireland, in Scilly, in the Channel Islands, on the Riviera, in Egypt or in India. *Diet* (p. 340).—Main constituents: Milk, bread, farinas, fats, fish, game, chicken, vegetables, fruit; half-cooked kidney. No alcohol unless specially ordered. Food to be varied in form. Effects of diet to be carefully tested by urine, pulse, dropsy, headache, subjective state, etc. *Medicines.*—(1) *For regular use.* Mild hæmatinics and diuretics: (*a*) ℞ Ferri et Ammonii Citratis gr. vi,

Potassii Citratis gr. xx, Tincturæ Aurantii ♏xv, Syrupi Aurantii ♏xxx, Aquæ ad ℥i. [U.S.P. ℞ Ferri et Ammonii Citratis gr. vi, Potassii Citratis gr. xx, Tincturæ Aurantii Amari ♏xv, Syrupi Aurantii ♏xxx, Aquæ Destillatæ ad ℥i.] Three times a day after meals. (*b*) ℞ Ferri Tartarati gr. v, Potassii Tartratis Acidi gr. xxv, Glycerini ♏x, Syrupi Aurantii Floris ♏xxx, Aquæ ad ℥i. [U.S.P. ℞ Ferri Tartratis gr. v, Potassii Bitartratis gr. xxv, Glycerini ♏x, Syrupi Aurantii Floris ♏xxx, Aquæ Destillatæ ad ℥i.] Three times a day after meals. In some cases add specific drugs: (*a*) ℞ Liquoris Arsenici Hydrochlorici ♏ii, Liquoris Ferri Perchloridi ♏x, Liquoris Strychninæ Hydrochloridi ♏i, Glycerini ♏xx, Aquæ ad ℥i. [U.S.P. ℞ Liquoris Acidi Arsenosi ♏ii, Liquoris Ferri Chloridi ♏ii, Strychninæ Hydrochloratis gr. $\frac{1}{110}$, Glycerini ♏xx, Aquæ Destillatæ ad ℥i.] Three times a day immediately after meals. (*b*) ℞ Potassii Acetatis gr. xx, Liquoris Ferri Acetatis ♏x, Liquoris Sodii Arsenatis ♏ii, Glycerini ♏xx, Aquæ Aurantii Floris ad ℥i. Three times a day immediately after meals. (2) *For occasional use.*—(*a*) *Purgatives.*—Every day or less frequently; according to degree of dropsy and amount of urine: ℞ Aloini gr. $\frac{1}{4}$, Extracti Nucis Vomicæ gr. $\frac{1}{4}$, Pilulæ Colocynthidis et Hyoscyami gr. iv. [U.S.P. ℞ Aloini gr. $\frac{1}{4}$, Extracti Nucis Vomicæ gr. $\frac{1}{4}$, Extracti Colocynthidis Compositi gr. iii, Extracti Hyoscyami gr. i.] At bedtime. (*b*) *Diaphoretics.*—If dropsy increase or urine seriously diminish: ℞ Potassii Acetatis gr. xv, Liquoris Ammonii Acetatis ℥iii, Spiritus Ætheris Nitrosi ♏xxx, Syrupi Aromatici B.P. ♏xxx Aquæ Camphoræ ad ℥i. Every four hours. Or ℞ Potassii Citratis gr. xx, Liquoris Ammonii Citratis B.P. [Liquoris Ammonii Acetatis, U.S.P.] ℥ii, Spiritus Ætheris Nitrosi ♏xxx, Syrupi Limonis ♏xxx, Aquæ Camphoræ ad ℥i. Every four hours.

Measures for occasional use.—1. *For Headache:* Rest in darkened room. Cold to head; or very hot sponge to head. A cup of fresh hot tea. A saline purgative (see above). (*a*) ℞ Liquoris Trinitrini ♏i-♏ii, Aquæ ℥i. [U.S.P. ℞ Spiritus Glonoini ♏i-ii, Aquæ ℥i.] At once. (*b*) ℞ Caffeinæ Citratis gr. v, Sodii Benzoatis gr. viii, Liquoris Trinitrini ♏$\frac{1}{2}$, Syrupi Rosæ ♏xv, Aquæ ad ℥i. [U.S.P. ℞ Caffeinæ

Citratis gr. v, Sodii Benzoatis gr. viii, Spiritus Glonoini ♏ $\frac{1}{2}$, Syrupi Rosæ ♏ xv, Aquæ Destillatæ ad ℥i.] Every four hours.

2. *For Uræmic Convulsions* (p. 342). — Attend to tongue. Give immediately (1) *a powerful cathartic:* (*a*) ℞ Olei Crotonis ♏i. To be mixed with a little butter and smeared on the back of the tongue. (*b*) ℞ Pulveris Elaterini Compositi gr. i-ii. [U.S.P. ℞ Triturationis Elaterini gr. $\frac{1}{4}$-$\frac{1}{2}$.] At once. (2) *A rapid diaphoretic:* (*a*) ℞ Pilocarpinæ Nitratis gr. $\frac{1}{10}$, Aquæ ♏ x. At once, hypodermically. (*b*) The hot air bath for 15 to 20 minutes. (*c*) The vapour bath for 15 minutes. (*d*) The hotwater bath (110°-120° F.) for 30 minutes — the patient sipping cold water, if conscious; followed by dry packing. (3) *A rapid diuretic:* Free drinking of hot water or hot weak tea; an enema of one or two pints of warm water.—Hot fomentations to loins.—Cupping loins.—If convulsions return: (*a*) administer chloroform by inhalation. (*b*) Give morphine gr. $\frac{1}{12}$-$\frac{1}{4}$ hypodermically. Or (*c*) venesect to 12 or 16 fl. oz. in case of very high tension and robust frame.

3. *For Uræmic Coma* (p. 342).—Persevere with diaphoretics and purgatives, as above.

4. *For Uræmic Restlessness and Delirium* (p. 342).—All the above diaphoretics and purgatives and a hypodermic injection of morphine gr. $\frac{1}{16}$-$\frac{1}{5}$. Or ℞ Hyoscinæ Hydrobromidi B.P. [Hyoscinæ Hydrobromatis U.S.P.] gr. $\frac{1}{200}$. Hypodermically, dissolved in ♏ v of distilled water.

5. *For Uræmic Vomiting* (p. 342).—Withhold food at first. Water iced or quite hot in sips. Half a teaspoonful of brandy in a tablespoonful of effervescing water. Gastric sedatives: (*a*) ℞ Acidi Hydrocyanici Diluti ♏iii, Spiritus Ammoniæ Aromatici ♏xx, Aquæ ad ℥i. Every two hours. (*b*) ℞ Tincturæ Iodi ♏iii, Aquæ ad ℥i. Every hour. (*c*) ℞ Hydrargyri Subchloridi gr. ii, Sacchari Lactis gr. ii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. ii, Sacchari Lactis gr. ii.] To be placed *under* the tongue. (*d*) ℞ Injectionis Morphinæ Hypodermicæ ♏ii-iv. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{10}$-$\frac{1}{5}$, Aquæ Destillatæ ♏v.] Subcutaneously. (*e*) Mustard to epigastrium. Later on: feed with peptonised milk or koumiss in tablespoonfuls; weak milky tea.

6. *For Uræmic Diarrhœa:* see p. 343.

7. *For Insomnia.*—(*a*) ℞ Paraldehydi ♏lx-♏xc, Misturæ Amygdalæ ad ℥ii. [U.S.P. ℞ Paraldehydi ♏lx-♏xc, Emulsionis Amygdalæ ad ℥ii.] At bedtime. (*b*) ℞ Sulphonalis gr. xx. In hot broth at 5 P.M. (*c*) ℞ Ammonii Bromidi gr. x, Potassii Bromidi gr. v, Chloralamidi gr. xx, Tincturæ Aurantii ♏xv, Syrupi Aurantii ♏xxv, Aquæ ad ℥i. [U.S.P. ℞ Ammonii Bromidi gr. x, Potassii Bromidi gr. v, Chloralamidi gr. xx, Tincturæ Aurantii Amari ♏xv, Syrupi Aurantii ♏xxv, Aquæ Destillatæ ad ℥i.] At bedtime.

8. *For Uræmic Dyspnœa ("Asthma").*—(*a*) ℞ Amyl Nitritis ♏v. To be inhaled from a crushed capsule. (*b*) ℞ Liquoris Ethyl Nitritis B.P. ♏xxx. To be given in 1 fl. oz. of water. (*c*) ℞ Liquoris Trinitrini ♏i, Aquæ ℥i. [U.S.P. ℞ Spiritus Glonoini ♏i, Aquæ Destillatæ ℥i.] At once. (*d*) Non-medicinal measures, see p. 343.

Treatment of Excessive Dropsy (p. 339).—Paracentesis or subcutaneous punctures with strict antiseptic precautions.

Treatment of Secondary Inflammations.—See *Acute Pericarditis*, p. 280; *Pleurisy*, p. 399; *Acute Pneumonia*, p. 408; *Acute Bright's Disease*, p. 318.

B. Interstitial Form.—*General Management.*—Rest of kidneys, arteries, heart, brain. Muscular exercise very moderate; occasionally complete rest or relief from work according to circumstances, and severity and stage of disease (p. 338). *Residence, Clothing, Climate*: as for parenchymatous form (p. 345). *Diet* (p. 340).—Spare in quantity. Chief constituents: farinaceous foods, including bread; vegetables, fish, chicken and game, mutton and beef sparingly, butter and fats freely, sub-acid fruits, milk moderately, tea, coffee, cocoa. No alcohol unless specially ordered.

Medicines.—(1) In early stages (p. 338): none; or mild hæmatinic tonics in different combinations: (*a*) ℞ Liquoris Ferri Acetatis ♏x, Potassii Acetatis gr. xx, Aquæ ad ℥i. Three times a day after meals. (*b*) ℞ Ferri Tartarati gr. viii, Liquoris Arsenicalis ♏iii, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Ferri Tartratis gr. viii, Liquoris Potassii Arsenitis ♏iii, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Three times a day immediately after meals.—Occasional morning

saline purgative: (*a*) ℞ Magnesii Sulphatis Effervescentis B.P. ½-1 oz., Aquæ ℥viii. (*b*) An aperient mineral water. —A vascular depressant for high arterial tension (p. 338): (*a*) ℞ Potassii Iodidi gr. v, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. ii, Sodii Sulphatis gr. xxx, Aquæ Camphoræ ℥i. Three times a day three hours after meals.—(*b*) ℞ Liquoris Trinitrini ♏i, Aquæ ℥i. [U.S.P. ℞ Spiritus Glonoini ♏i, Aquæ Destillatæ ℥i.] Two tablespoonfuls three times a day.—(2) In later stages (p. 339), a vascular depressant and cardiac tonic for disposition to failure of heart: ℞ Potassii Iodidi gr. v, Potassii Citratis gr. xx, Ammonii Carbonatis gr. iv, Tincturæ Digitalis ♏v-x, Tincturæ Nucis Vomicæ ♏v, Aquæ Camphoræ ad ℥i. Every four hours, after meals. — For cardiac distress and dyspnœa: (*a*) ℞ Spiritus Ætheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii ♏xx, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Spiritus Ætheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii Amari ♏xx, Aquæ Camphoræ ℥ii, Aquæ Destillatæ ad ℥i.] When required. (*b*) ℞ Liquoris Strychninæ Hydrochloridi ♏iii. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏x.] Hypodermically. —A cardio-vascular diuretic for dropsy of cardiac type (p. 339): ℞ Tincturæ Digitalis ♏x-xv, Potassii Iodidi gr. v, Potassii Acetatis gr. xx, Infusi Scoparii B.P. ad ℥i. Every four hours, after meals. See also Heart; Failure of Compensation, p. 315.—*For Dropsy*, see p. 339.—*For occasional use* in uræmia, etc., see Parenchymatous Form (p. 346).

CHAPTER XIV.

GRAVEL AND URINARY CALCULUS.

A STUDY of the natural history of gravel and urinary calculus from the therapeutical point of view serves to convince the student in a peculiarly interesting way of the importance of attention to ætiological indications. Once formed, urinary calculus is an inert mass which can only be treated mechanically. What appears to be other treatment, the pursuit of its chemical constituents by means of solvents, proves to be really prevention of further deposit by attention to the causes of precipitation. But for all this, it is a highly instructive consideration that prevention does not come too late even when the disease is already in existence. We shall presently find that the chief part of treatment in renal calculus from the medical side is directed against the conditions in which it originated, although it may have been in existence for twenty years, inasmuch as they are still at work aggravating it and promoting its recrudescence. In this connexion also the treatment of calculus cannot but impress the student with a sense of the remoteness of causes from the disease in certain instances, calculus proving like Bright's disease to be as it were an affection thrust upon the kidneys by disorders of digestion and metabolism; and he will not fail to appreciate therefore the importance of breadth of view in approaching its therapeutics. He will also learn under this heading the extreme value of close, exact, discriminating observation of clinical phenomena, extending possibly over months or years, in affording clear indications, and the value also of deliberate action.

The disease known as gravel or calculus occupies two stages:

first, the deposit of solids from the urine within the urinary tract, an affair of chemistry; second, the pathological effects of the deposit on the structures around it. It is useful to keep these stages mostly apart in discussing the subject. The pathogeny of the different kinds of gravel—uric acid, calcium oxalate, phosphates, etc.—is naturally different; and of some of the kinds it is still obscure. We shall confine the present discussion to the two kinds which are the most common, uric acid calculus and calcium oxalate calculus, with a few references to phosphatic crusts and to the fusible calculus of secondary origin.

Uric Acid Gravel and Calculus.

Ætiological Indications. — For a great part of the exact knowledge which we possess of the origin of uric acid gravel and calculus we are indebted to the late Sir William Roberts, whose account of the pathogeny of this affection will be followed closely in the present discussion.[1]

The disease consists in the premature liberation of uric acid from chemical combination (urates) and its precipitation within the urinary tract, where it may prove the cause of much distress and provoke a number of serious pathological changes. When this decomposition and precipitation occur, either the urine is passed sparkling with minute crystals of uric acid, as we often find in children; or showers of "cayenne pepper grains" come down in the water—gravel; or the crystals are agglomerated, constituting a calculus. The conditions of the urine which tend to accelerate the precipitation of uric acid are chiefly: high acidity, high percentage of uric acid, poverty in saline constituents, and low pigmentation. Of these the most important is the grade of acidity.[2] The origin of gravel in hyperacidity of the urine connects this disorder with an excess of animal food;[3] with infrequent large meals;[4] with prolonged muscular exercise,[5] and with hepatic

[1] "Uric Acid Gravel and Gout," 1892.
[2] Roberts, *op. cit.* p. 54.
[3] Halliburton, "Chemical Physiology," p. 714.
[4] Roberts, *op. cit.* p. 66.
[5] Halliburton, *loc. cit.*

and digestive disorders.[1] A high percentage of uric acid is a readily intelligible factor of gravel, but care must be taken not to confound with high percentage a simple excess of visible uric acid in the urine. The urine after meals is indeed rich in uric acid, but it does not fall out; and the total quantity of uric acid excreted *per diem* may be in excess without deposit. On the other hand, gravel may be formed when uric acid is only in normal amount in the urine, or even less than normal. Still, other things being equal, an absolute excess of uric acid does favour its precipitation; and therefore, as Sir William Roberts says, a lowering of the level of uric acid excretion is an important therapeutical indication.[2] These disturbances in the excretion of uric acid, as far as they are understood, appear to be referable to large eating, particularly of food rich in proteid materials,[3] to alcohol, to insufficient consumption of water, and to sedentary, worrying mental occupations; and they are closely connected with those functional disturbances of the liver and digestive organs and of metabolism generally which constitute "lithæmia."[4] In this relation inheritance has to be borne in mind. The concentration of the urine secreted during the night, consequent on slowness of circulation, recumbency, rest and fasting specially favours the occurrence of precipitation at that time.

It would appear then that the principal circumstances to be kept before us when we are in search of ætiological indications for the prevention and remedy of gravel are connected with eating and drinking, whilst the influences of bodily exercise and of the mind on the alimentary and metabolic processes are not to be overlooked. Fortunately, we have more control over the intake of food than over any other function; and a clear appreciation of the remote origin of gravel puts us in a position to prevent it if our assistance be sought in time and strictly followed. The most important instructions that can be given to the actual

[1] Murchison, "Diseases of the Liver," p. 631.

[2] Roberts, *op. cit.* p. 59.

[3] Roberts, *op. cit.* pp. 60 and 122; Hamilton, "Text-Book of Pathology," 1894, vol. ii. p. 339.

[4] Murchison, *op. cit.* p. 629, and *seriatim;* Coats, "Pathology," 2nd ed. 1889, p. 851; Oliver, "Bedside Urine Testing," 1885, pp. 76, 79.

or probable subject of gravel as regards his diet are two: first, to eat little — of anything; second, to drink much —of water. At least four small and light meals should be taken a day, of simple, ordinarily mixed, digestible food; and plenty of some light beverage should be drunk towards or at the end of each meal, the best being water at luncheon and dinner, tea and coffee (properly prepared) at the other meals. A draught of water night and morning is also necessary: at night cold, and perhaps sparkling; in the morning in the form of a large cup of hot water or weak tea. The ordinary English habit of drinking one or two glasses of claret or a glass of ale with a large meal, and no water, is particularly to be forbidden.

If these simple directions be observed, it will often be unnecessary, and it would be unwise, to dwell upon the individual foods to be eaten and avoided. But if dyspepsia, the state of the urine, lumbar pain, and other manifestations of gravel indicate the need for more strict attention in this direction, such articles of diet must be removed or reduced as are notoriously likely to produce heavy acid urine—excess of meat, pastry, milk as a beverage or largely in any form, oatmeal, and wine even in moderation. The patient should be instructed to eat chicken, game and other white meats in moderation, fish, farinaceous foods freely, vegetables and fruits, with which he may satisfy his cravings, and to drink water freely in any wholesome form. But he must be dissuaded from continual attention to the details of his meals. Self-observation is peculiarly likely to be indulged in by the subject of gravel, to increase his anxiety and depression, and thus to aggravate the disease. So important is it to secure wholesome nervous influences in this affection, and to leave the automatic processes of nutrition to themselves, that in the treatment of many of the subjects of gravel it is better practice to order simply small mixed digestible meals in general terms, and abundance of water, than to particularize and dwell on this kind and that kind of food to be avoided. Children should be taught to eat freely of salt with their food and thus overcome an important factor in lithuria, poverty in salines. At the same time the digestive and hepatic functions may demand attention by

means of simple alkaline and stomachic combinations before meals, and occasional mercurial and other purgatives and cholagogues. Careful instructions will be called for on the subjects of exercise, baths, clothing and mental occupation. Occasionally tonics and alteratives such as nux vomica, quinine and arsenic will be given with judgment, that is, with due respect to the activity of the elementary functions of digestion and elimination.

If these measures fail, as they very often do, the acidity of the urine must be reduced by means of alkalis. Mild alkaline compounds, such as potassium citrate, may then be given. Or an alkaline table water may be ordered, such as Vichy, Bilin, Apollinaris, Rosbach, etc., of which the patient may consume a large tumbler after each meat-meal, as well as another at bed-time, and a fourth in the early morning combined occasionally with a little aperient water such as Rubinat. In this connexion we appreciate the great value of Sir William Roberts' suggestion for the prevention of gravel in cases where the disposition persists for long periods and much drugging is undesirable: to leave the day to take care of itself, and safeguard the night by ordering the alkaline draught at bed-time only, so as to neutralise the increased disposition to uric acid deposit during sleep. In bad cases this draught may be repeated during the night when the patient has a call to urinate or is roused by pain, or even during the day—in the forenoon and late afternoon. It is not necessary and certainly it is not desirable to alkalinise the urine in chronic gravel: only to *reduce the acidity* and take advantage of the associated diuresis. The depression and disposition to phosphatic deposit which attend the free administration of potassium must not be disregarded. Piperazin is sometimes employed instead of the older drugs. When the antacid treatment has been continued a few days, the disposition of the urine to early deposit of uric acid is tested; and the method continued, modified in severity, or stopped, according to the result obtained. All the other measures must be strictly observed for a considerable time, however; and the re-appearance of symptoms would indicate the necessity to return to the alkali at bed-time.

Certain natural mineral waters, such as those of Vichy, Vals, Bilin and Neunahr in the old world and the Bladon and the Sheldon Springs in the United States, contain in very weak solution the alkaline salts which are indicated for the treatment of uric acid gravel. Other powerful waters containing sulphates, such as those of Carlsbad and Tarasp in Europe and the Bedford Springs in North America,[1] fulfil associated indications. But a "course" at a well-conducted spa consists of much more than the administration of the saline constituents of its waters. An enormous amount of fluid is passed through the kidneys, washing out particles of gravel and possibly bringing down by its very weight any calculus that is present; indeed a third class of waters which prove highly efficacious in the treatment of this disease, the carbonated earthy waters of Contrexéville, Wildungen and allied springs, can have but little other action than this. At the same time the patient enjoys all the benefits of a complete change. He is strictly dieted, takes a rational amount of rest and exercise, is free from worry, and is encouraged and benefited by the occasional appearance of particles in the urine.

The principles of treatment which thus flow solely from a study of the ætiology of uric acid gravel are applicable under three sets of circumstances. First, when gravel occurs or calculus already exists, in order to prevent aggregation, growth, or multiplication. The improvement that follows this line of purely preventive treatment is sometimes remarkable. As the means employed cannot have any direct effect on the stone, it will become clear to us how much the calculous disposition with its attendant disorders of digestion, liver and nervous system, independently of the actual presence of the calculus itself, has to do with the production of what are called the symptoms of stone in the kidney; and how many of these are, for the same reason, not difficult to remove. Proper dieting, the restoration of a moderate degree of acidity of urine, free diuresis, and properly balanced rest and exercise will remove in great measure the local distress and the depression and debility. Secondly, these principles are to be observed after

[1] Osler, "Principles and Practice of Medicine," 3rd ed. p. 896.

the successful passage of calculus or its removal by operation, to prevent recurrence. Thirdly, they should be more respected than is the case at present in the children of the subjects of calculus, in order to protect them in time from the deposit of gravel which is liable to occur insidiously in the kidney, particularly during debilitating illnesses. In a disease so definitely recurrent as calculus, so definitely hereditary, and at the same time so distressing and serious, there ought to be no hesitation in the employment of the abundant, simple and efficient measures which we have reviewed. It is highly important that the family practitioner should impress these considerations on the parents of children liable to stone, especially in particular parts of the country where the disease is recognised as common.

Pathological Indications.—Once formed, uric acid concretions occupy a position in the substance of the kidney, the pelvis of the ureter, the ureter or the bladder; and there they simply produce the pathological effects of a foreign body.[1] Within the renal tissue they are rarely found, imbedded more or less firmly, and producing irritation and atrophy of the parts around and occasional hæmorrhage. In the pelvis a calculus grows by accretion of fresh urinary deposit in the presence of mucus and blood. Here it is much more movable than in the substance of the kidney; and pyelitis of every degree, progressive atrophy of the papillæ and occasional hæmorrhage are the characteristic results, whilst risk of its descent into the ureter is imminent. Surgical interference or other causes of cystitis, often in connexion with a previous stone, may originate bacterial infection, with ammoniacal decomposition of urine, which ascends to the pelvis and establishes a foul pyelitis and a deposit of secondary fusible crusts on the original calculus as nucleus, indefinitely increasing the size of it and the gravity of the condition. Once in the ureter, a calculus is usually conducted safely into the bladder; but it may become arrested temporarily or impacted permanently here, and set up local disease and hydronephrosis. Arrived at the bladder calculus is within easy reach of the surgeon.

These pathological facts afford many valuable indications.

[1] Pye-Smith, "Ætiology of Disease," 1895, p. 7.

A calculus imbedded in the renal substance or wedged into one of the calyces might be *fixed* there in the hope of its becoming encapsulated and latent; an attempt might be made to *dissolve* it; its *discharge* by the ureter might be promoted; or lastly, it might be *removed* bodily by the surgeon.

Nephrolithotomy is now a highly successful operation in suitable cases, the selection of which involves many considerations; and it ought always to be seriously entertained. When removal is not adopted as a means of cure, fixation holds out some prospect of success;[1] but it appears to be seldom practised. The method involves a protracted period of absolute rest in bed, and the result is doubtful. Solution also may be said to be rarely attempted nowadays, as distinguished, that is, from the measures already discussed for preventing actual growth.[2] Free water-drinking is the method adopted in the great majority of instances, and it is sometimes rewarded with the discharge of one or more calculi, particularly if the method be practised systematically at a recognised spa, such as Contrexéville or Vittel. Very often we do none of these things, but advise the patient to let well alone, particularly if stone formation appear to have been developed at or after middle life and to be still active, as distinguished from the formation of a single calculus dating from childhood.

Whether the stone be removed or no, there is an obvious pathological indication for the relief of pyelitis by means of diet and drugs calculated to soothe, disinfect, repair and thoroughly flush the inflamed mucous membrane. Bland watery fluids should be freely consumed, including distilled water and infusions or decoctions of linseed, triticum repens, uva ursi, buchu or barley. The abundant flow of urine that follows will wash and drain the pelvis of the ureter, and at the same time will have the invaluable effect of preventing fresh agglomeration of uric acid with the inflammatory products. Borates and benzoates are the most satisfactory urinary disinfectants; and are urgently indicated when ammoniacal decomposition has been set up, with foul pyelitis

[1] Owen Rees, "Croonian Lectures," 1856, p. 77.
[2] Roberts, *op. cit.* p. 55.

and a secondary growth of fusible phosphates on the surface of the calculus. Under these circumstances, particularly if pyonephrosis have developed, the grave operations of nephrotomy and nephrectomy have to be considered. If they be rejected, much relief may be obtained from daily massage of the renal tumour so as to assist natural drainage; warm support of the belly and loins with a flannel binder; avoidance of exposure to cold and wet; comparative rest from work, but gentle exercise in the erect posture; a more generous diet, in consideration of the purulent discharge, but including an abundance of liquids; and the administration of tonic drugs as required.

When a stone is engaged in the ureter the principal indications are of a clinical kind, and they will be discussed immediately under the proper head.

Clinical Indications.—The clinical characters of renal calculus which furnish special indications for treatment are pain and suffering generally, of great variety of character and severity; impairment of the general health and strength; and disturbances of the urine and of urination. The persistent wearing ache in the lumbar region characteristic of calculus lying in the pelvis, with its occasional exacerbations by many circumstances, accompanied with nausea or actual sickness and depression, should be controlled by rest, warmth, simple and nutritious but unstimulating diet, nervous relaxation with cheerful encouraging surroundings, and local applications, support, pressure, friction, etc. Internal anodynes should be avoided if the pain be tolerable. Individual patients gradually learn what they must avoid and what they may do in order to prevent or remove discomfort. If the pain render life a burden, the pathological indication for operation is strengthened, and it is usually under these circumstances that operation is resorted to.

Paroxysms of violent pain constitute renal colic, whether the calculus be engaged in the ureter or no. Palliative indications are now paramount: pain must be immediately controlled, the patient rescued from a state of collapse, restlessness and vomiting arrested; but at the same time the safe passage of the stone is to be promoted. Morphine combined with atro-

pine hypodermically is here the sovereign remedy, the size and the frequency of the dose being sufficient to arrest pain and secure rest and quiet, if not actual sleep, whilst sickness ceases and the circulation is restored. Chloroform is sometimes required. Inversion and shaking have given relief in some instances; in other instances gentle friction along the course of the ureter. Hot local applications, a prolonged hot bath and large warm water enemata are means of increasing the sense of relief and comfort and assisting the stone to escape. The general body-heat will be restored and maintained by the same and other familiar measures, including abundance of warm fluids (in some instances with the addition of spirits) as drinks, which fulfil the second indication by promoting the pressure of urine upon the calculus and washing out the blood and mucus. Persistent vomiting sometimes demands the administration of food and stimulants per rectum. A continuance of pain may call for repetition of the morphine; and the local applications and free consumption of diluents should be kept up for some days, along with an alkaline diuretic mixture. In attacks of gravel the same kind of treatment is indicated in a milder form. Morphine may not be required, and should be replaced by hyoscyamus in combination with alkalis. The kidneys, ureters and bladder must be thoroughly flushed by means of large warm drinks, to free them of particles of gravel, blood, mucus and inflammatory products, which might prove fruitful media for future deposits or accretion; and to remove the last traces of structural injury and irritation.

The impairment of the general health which characterises this painful disease, with its nights of broken rest and days of weariness, anxiety and depression, all possibly persisting for years and recurring after colic or even after operation, calls for encouragement, rest of mind and body, and change of air and scene. There is no disease in the management of which it is more necessary to practise deliberation, and insist on repeated and complete observation and study of the clinical phenomena. There must be no panic, as there often threatens to be on the discovery of renal calculus

in an active, busy man. Every specimen of urine, properly employed, increases the accuracy of the diagnosis and conduces to better treatment. The unimportance as guides to treatment of passing clouds of oxalates or urates will thus be determined, compared with the persistence of albumen, leucocytes, characteristic epithelium, and occasional fragments. Blood, either in minute traces constantly or in the form of hæmorrhage occasionally, is of great clinical value, both for diagnosis and for direct therapeutic purposes, suggesting irrigation to prevent accretion and aggregation, and to promote discharge. The physical signs also offer valuable indications.

Indications from Course.—The course of renal calculus and gravel is of chronic or indefinite duration, and very various in the severity of symptoms and the occurrence and gravity of complications. If the suffering be not great, consisting mainly of pain on exertion, ready fatigue, and occasional disturbances of the urine, the best plan is to pursue steadily the simple measures for preventing accretion and promoting the discharge of small calculi; otherwise letting well alone. In such cases an annual visit to a spa is advisable. A few weeks spent at Carlsbad, Contrexéville or Vichy may be quite successful, one or more stones being discharged, or at any rate relief afforded for a considerable length of time. But if on the other hand, in spite of preventive and palliative treatment, life be full of suffering, and pain be ever present, though moderate in degree, the nights broken, work seriously interrupted, and health and strength sapped, then the question comes to be raised, sooner or later, whether the misery and progressive danger should not be ended summarily by surgical interference.

Complications occurring in the course of renal calculus will call for treatment, which is usually of a surgical kind—the relief or radical cure of pyelitis, impaction, pyonephrosis, abscess, etc.

Lastly, if the disease have been happily terminated by the discharge, fixation, solution or removal of a stone, the period of convalescence and indeed the whole subsequent life of the patient will have to be studied and guarded. First, the patient's health ought to be thoroughly restored. A sea-voyage

is very desirable at this stage. Now is the time to pursue for an indefinite period the method which we studied under the head of ætiology for preventing fresh calculus formation.

Oxaluria and Oxalate of Lime Calculus.

The pathogeny of this disturbance of the urine is still imperfectly known, and the treatment of it correspondingly unsettled. It is often intimately associated with uric acid gravel; and in most respects the prevention and removal of the two kinds of concretions have to be similarly attempted on the principles already laid down. It is necessary only to discuss a few points special to oxaluria, and related mainly to the ætiology of the disorder.

Oxalate of lime appears in the urine after free indulgence in certain kinds of food, such as rhubarb, tomato, cabbage and onion, which contain oxalates; nitrogenous materials if they should be imperfectly metamorphosed in the processes of alimentation; and saccharine and amyloid principles when they undergo fermentation in the digestive tract and yield organic acids. It is plain therefore that the subjects of persistent oxaluria, whilst treated by the methods which were found to be indicated in uric acid gravel, should be specially instructed to eat sparingly as a whole; to have a comparatively liberal allowance of digestible, nutritious animal food, such as lean mutton, chicken and game; to avoid the vegetables just named; and to beware of indulgence in puddings and sweets. Alcohol is also to be forbidden. Means must be taken to secure more healthy action of the digestive organs and liver, by ordinary bitter stomachics, combined with either acids or alkalis according to recognised indications. In connexion with treatment a course of natural sulphated or muriated alkaline waters may be recommended, for instance those of Carlsbad, Ems, Seltzers and Apollinaris in Europe, or the Congress and St. Louis Springs in the United States.

A low, depressed condition of the nervous system is frequently associated with oxaluria; and although it cannot be certainly regarded as a cause of the renal disorder, wasting and disturbed metabolism, it calls for tonic remedies in the shape of

exercise, baths, a change to the country or coast, cheerful society, and carefully planned courses of acids, strychnine and allied drugs.

Outline of Practice.

A. *In Uric Acid Gravel and Calculus.*

I. Prevention of Increase and of Return.—*General Management.*—*Exercise and rest:* regular exercise, according to ability and taste, short of exertion with profuse perspiration. Massage for some patients. Moderate pain to be relieved with friction and simple warm applications. *Baths:* regularly, cold or tepid, with abundance of soap. Turkish bath occasionally. *Clothing:* Warm, woollen; woollen abdominal belt. *Diet* (p. 352): Four meals a day, all spare in respect of amount of food. *Breakfast* (8.30 A.M.): Toast or stale bread; eggs lightly boiled or poached; bacon broiled or cold boiled; fresh white fish; butter in moderation; weak tea, two large cups at end of meal. *Luncheon*, or "early dinner" (1 P.M.), and *dinner* or "supper" (7.30 P.M.). Meat once a day only. Fresh white fish, chicken, game, sweetbread, brain, calf's head, and other light dishes, *simply* dressed. Vegetables: potato in small quantity (squeezed), spinach, cauliflower, sea-kale, very tender young cabbage, light salads. Sweets: better avoided, excepting plain milk puddings in strict moderation, or subacid fruits stewed with sodium or potassium bicarbonate. *Tea* (5 P.M.): A large cup of weak freshly-made tea; toast or dry biscuit. *Beverages* (pp. 353, 354). No alcohol unless otherwise indicated, or after years of freedom from gravel and pain; then light good-class Bordeaux or very weak spirit and water. At 7 A.M. a breakfast-cupful of freshly-made weak tea. Water, at least 10 fl. ounces at the end of each meat meal—distilled, aërated, hot, or a natural table water—Vichy, Bilin, Rosbach, Apollinaris, Johannis; Poland, Mount Hartford, Tredyffrin, etc. At bedtime a large glass of water as taken with meals. Milk never to be ordered as a beverage; and always to be sparingly allowed, even in children. *Medicines* (p. 354): (1) An occasional mercurial purgative: ℞ Pilulæ Hydrargyri gr.

iii, Pilulæ Rhei Compositæ gr. ii. [U.S.P. ℞ Massæ Hydrargyri gr. iii, Pulveris Rhei gr. $\frac{1}{2}$, Aloe Socotrinæ gr. $\frac{1}{3}$, Myrrhæ gr. $\frac{1}{3}$, Saponis gr. $\frac{1}{3}$, Olei Menthæ Piperitæ ♏ $\frac{1}{3}$.] At bedtime; to be followed with an aperient saline in the morning. (2) A mild stomachic and antacid mixture: ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏ x, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day 5 minutes before the principal meals. (3) An arsenical and tonic mixture (p. 354): ℞ Liquoris Arsenicalis ♏ iii, Tincturæ Nucis Vomicæ ♏ v, Ammonii Carbonatis gr. iv, Spiritus Chloroformi ♏ viii, Infusi Quassiæ ad ℥i. [U.S.P. ℞ Liquoris Potassii Arsenitis ♏ iii, Tincturæ Nucis Vomicæ ♏ v, Ammonii Carbonatis gr. iv, Spiritus Chloroformi ♏ viii, Infusi Quassiæ B.P. ad ℥i.] Three times a day, immediately after meals. (4) Urinary Antacids and Diuretics (p. 354): (1) Simple: ℞ Potassii Bicarbonatis gr. xxx, Aquæ ℥iv. Once, twice, or thrice a day, effervescing with a tablespoonful of fresh lemon juice or 21 gr. of Citric Acid. (2) A purgative combination: ℞ Potassii Bicarbonatis gr. xv, Sodii Bicarbonatis gr. v, Ammonii Carbonatis gr. iv, Magnesiæ Ponderosæ gr. v, Rhei Radicis gr. v, Ipecacuanhæ Radicis gr. $\frac{1}{2}$, Aquæ Menthæ Piperitæ ℥i. Once, twice or thrice a day. Times of administration of antacid medicines: a dose at bedtime only; if necessary, a second dose at 5 or 6 A.M.; in severe cases, a further dose at 4 P.M.—*Spas:* see page 355.

II. Attempts at Radical Cure.—Nephrolithotomy and other operations; fixation; solution; discharge. See p. 357.

III. For Renal Colic (p. 358). 1. *At first visit.—General Management.*—Bed compelled. Hot india-rubber water bottles and blankets. (*a*) *If the pain be tolerable:* hot applications in form of fomentations, hot water bag, or linseed poultices to loins and abdomen; abundant drinks of hot water, without or with one or two fl. oz. of spirits. Or administer large warm water enema; and after evacuation, place patient in a bath at 98° for $\frac{1}{2}$ to 1 hour; abundant hot drinks. (*b*) *If pain be intolerable, or if not relieved by these measures:* ℞ Injectionis Morphinæ Hypodermicæ ♏ v-x, Liquoris Atropinæ Sulphatis ♏ i-ii. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{4}$-$\frac{1}{2}$, Atropinæ Sulphatis gr. $\frac{1}{110}$-$\frac{1}{55}$,

Aquæ Destillatæ ℥v.] At once, subcutaneously. More morphine to be given according to severity of pain and collapse. If no relief after fifteen minutes, repeat the hypodermic injection. If still no relief, administer chloroform or ether until pain ceases, intermitting anæsthesia at intervals to test result. If hypodermic injection not available: ℞ Tincturæ Opii ℥xxx-xlv, Aquæ ʒi. To be given immediately; the patient placed in a bath at 98° under careful observation till drowsy; then removed, dried, and put to bed. *Diet.*—Hot milk, milk and water, thin milk gruel, barley water, linseed tea, hot water in abundance. No objection to cold water if craved for. *If vomiting persist:* water as hot as can be sipped; feeding per rectum, adding ½ fl. oz. of brandy to each enema. When collapse passes off, stop stimulants.

2. *In interval of visits.*—Continuous application of warmth to loins. Hot drinks to be continued as demanded and as borne. *Constipation:* relieved by large warm water or soap-and-water enemata alone, or after Calomel gr. iv.

3. *If Colic return.*—Repeat morphine and atropine hypodermically as required.

4. *After-Treatment.*—Dispense with morphine or opium as early as possible. Control remains of pain with local applications. Rest in bed to be continued until lumbar and abdominal soreness has disappeared. Then tentative sitting up. *Locally:* dry, warm flannel roller to loins and abdomen. *Diet.*—Farinaceous: fish, chicken, etc., gradually. Abundant draughts of pure water, hot or as distilled water, until microscopic evidences of blood and gravel have disappeared from urine. *Medicines.*—An alkaline diuretic and genito-urinary sedative: ℞ Potassii Citratis gr. xxx, Tincturæ Hyoscyami ʒi, Aquæ ad ʒi. Every six hours, between meals.

5. Return to treatment for prevention of increase or return of renal calculus (p. 362).

B. *In Oxaluria and Calcium Oxalate Calculus.*

Preventive and remedial treatment as for uric acid gravel and calculus (*q.v.*) *Special Considerations.*—*Exercise:* regular,

in open air, daily. *Baths:* cold or tepid, with friction. *Diet.*—Exclude rhubarb, tomato, onion. Vegetables of cabbage species, farinaceous puddings and sweets of all kinds to be used sparingly, and their effect on digestion and urine noted. *Medicines.*—An alkaline stomachic and tonic: ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏viii, Tincturæ Nucis Vomicæ ♏v, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day, 5 minutes before meals. An acid stomachic and tonic: ℞ Acidi Nitro-hydrochlorici Diluti ♏x, Liquoris Strychninæ Hydrochloridi ♏iv, Tincturæ Aurantii ♏xxx, Aquæ ad ℥i. [U.S.P. ℞ Acidi Nitro-hydrochlorici Diluti ♏x, Strychninæ Hydrochloratis gr. $\frac{1}{28}$, Tincturæ Aurantii Amari, ♏xxx, Aquæ Destillatæ ad ℥i.] Three times a day, after meals. *Change of air:* bracing resorts on coast or on hills. *Spas:* see p. 361.

CHAPTER XV.

ACUTE BRONCHITIS.

Several of the most elementary and important principles of rational therapeutics come prominently before us in a study of acute bronchitis. The necessity of fully recognising predisposition as well as the efficient and determining causes will be seen to be so obvious as hardly to require enforcement. Of peculiar interest will be found to be several familiar pathological indications, such as the control of vascular reaction and still more the removal of inflammatory products, the retention of which urgently threatens the patient's life. This part of the subject is essentially associated with the proper employment of clinical phenomena as symptomatic and significant of pathological states, especially with the correct interpretation of cough and dyspnœa. Acute bronchitis is also of therapeutical interest as a disease of indefinite duration, calling for immediate and active interference instead of expectancy.

Ætiological Indications.—*Preventive Treatment.*—The knowledge which we now possess of the causes of acute bronchitis enables us to attempt the prevention of it with some hope of success. We have to protect certain predisposed subjects from certain conditions or influences which either constitute efficient causes or at least promote their actions.

The subjects predisposed to bronchitis are particularly infants, children and the very aged; previous sufferers from acute bronchitis, or persons suffering from chronic bronchitis; the emphysematous, tuberculous, rickety, gouty and asthmatical; and patients with disease of the heart or kidneys. Most of the morbific influences reach the bronchi directly,

that is, through the atmosphere and upper respiratory passages —cold and damp air; irritant gases; foreign particles in the forms of dust, pollen and fog; secretions or discharges from the mouth, throat and respiratory organs; and probably the contagia of measles, pertussis, influenza and other diseases. Certain of the causes of bronchitis appear, on the other hand, to be conveyed to the bronchial walls by the blood, including the contagion of typhoid fever, such extrinsic poisons as antimony, ipecacuanha and the iodides, and such intrinsic poisons as that of gout. Climate, weather, occupation, etc., either increase the liability of the mucous membrane, or favour the production and entrance of efficient causes. The pathogenetic relations of some causes are obscure. Does a man "catch cold in the bronchi" because he is gouty, or "get gout in the bronchi" because he has caught cold there?

The most obvious way of preventing bronchitis is to avoid the causes of it; and this rule applies to highly susceptible persons. The infant, the aged, and the subject of serious structural disease of the lungs, heart and kidneys have to be specially protected by being warmly clad, kept indoors in unfavourable weather, or possibly ordered to winter abroad, whilst treatment otherwise is directed to the particular cause of their debility. The subject of hay-fever is directed to flee from pollen in the month of June by taking a sea voyage.

In less susceptible persons, and particularly in delicate children or adolescents with nothing more definite than "weak chest," an effort should be made to insure prevention of bronchitis by working as it were from the other end—by strengthening resistance or removing predisposition. It is in every respect more satisfactory to harden or acclimatize an English or American child to its native climate than to protect and coddle him, a method which may be immediately successful but which maintains and possibly increases the condition of delicacy and susceptibility. This desirable object is to be attained by tonic or bracing measures: light but sufficiently warm clothing, cool rather than warm baths, daily exercise in the fresh air unless the elements be altogether inclement, correct personal hygiene generally—including attention to feeding and action of the bowels, and the administration of

cod-liver oil, iron, strychnine and other recognised tonics in suitable forms. The effects of several of these measures may be comprehensively secured by residence in a moderately bracing climate, according to the season of the year. Eastbourne or Folkestone, Shanklin, Sandown, Tunbridge Wells, and the coasts of Somerset, Suffolk and Norfolk are places calculated to agree with the average case of this description; but some delicate persons disposed to bronchitis must seek milder places in winter and early spring, such as Bournemouth, Ventnor, Torquay, Falmouth, Penzance and Hastings; whilst others can live safely, and, if safely, with great advantage, at Margate, Ramsgate, etc.

Remedial Treatment.—When acute bronchitis has actually commenced, the previous considerations with respect to its ætiology must still be kept before the mind of the practitioner. Bronchitis is not one disease, but a catarrh or bronchial inflammation of various kinds, like sore-throat or pleurisy, according as cold, gout, influenza, tubercle, measles, pollen, etc., is the efficient cause at work; and it is also a different disease in different subjects. Appreciating this position, we find that the first ætiological indication is to deal with the cause directly. Cold is of course removed by means of a warm room (a temperature of 60° to 65°, day and night), a tent-bed, and inhalation of warm vapours. Gout, a very common cause of bronchitis in England, calls for a smart mercurial and saline purge, low diet, removal of stimulants, and the employment of an alkaline iodide mixture at short intervals. Influenza and measles will be respectively treated on the most approved system. If the case be mild, whether due to weather, locality or season (hay-fever), the patient had better be sent away at once to a suitable climate. The second ætiological indication is to deal with any kind of debility, delicacy or disease of which the patient may be also the subject and which has laid him open to the bronchitis: emphysema, tuberculosis, cardiac or renal disease, and the other morbid conditions which we have enumerated. It is not only theoretically correct to remember these as being contributory circumstances: it is found practically that when they are present the patient suffers more severely, is in greater danger,

and is more liable to relapses of the bronchitis, which tax our resources very heavily. The different methods of attending to this indication, being of great variety, need not be referred to in detail here.

Pathological Indications. — The indications for the treatment of acute bronchitis suggested by a survey of its pathological characters are those common to catarrhal inflammation in general, and those proper to serious involvement of the most vitally important mucous tract in the body.

Our first object naturally is to attempt to deal with the destructive element of the morbid process. We have already seen how this may partly be done by dealing with the cause, specific or other, which is at work. Rest, so invaluable in inflammation, is practically unattainable in the bronchi with continual respiration and frequent cough. The vital resistance of the tissues has to be sustained by strict attention to nutrition in the fullest sense of the term, elimination as well as alimentation. The second indication is to control inflammatory reaction. Bleeding and leeching were once much favoured in acute bronchitis, and are still occasionally employed, but more for the purpose of relieving venous fulness connected with respiratory difficulty than of reducing active hyperæmia of the bronchial walls. It is common practice, however, to order circulatory depressants at the invasion of this disease, antimony and ipecacuanha being selected because they are also useful expectorants, as will be discussed presently. Perhaps of all the measures employed purgatives prove most useful practically; and here again the action may be mainly on the vessels. Whilst vascular tension within the bronchial tissues is thus relieved by different measures which influence the circulation as a whole, a series of local vascular sedatives are also rationally called into action. These are warmth and moisture of the respired air, including actual inhalations of watery vapour, variously medicated; rubefacient applications to the chest or at least cotton-wool jackets; and warm liquid nourishment. It is necessary to employ both the general and the local remedies, and to continue them for several days, inasmuch as the hyperæmia is accompanied with swelling and recurrent spasm of the bronchial walls which constitute the first cause

of respiratory obstruction, a grave element in the disease. This introduces us to the next indication for treatment, the removal of the products and effects of the catarrh. The bronchial passages are not only seriously narrowed by swelling and spasm, but blocked by mucus, leucocytes, desquamated epithelium, other *débris*, and froth, which is perhaps the worst of all. Inspiration and expiration are interfered with. Collapse and lobular congestion tend to develop. The circulation in the pulmonary vessels and heart is subjected to strain. In a word, the pathological characters of asphyxia come on; and are mainly traceable to bronchial obstruction. Fortunately there is a natural provision for removing the catarrhal products and of preventing or relieving the effects of their temporary retention. This is cough and expectoration. We shall consider these presently in our study of the clinical indications. Here it will be easy to appreciate the vital importance of sufficient, well-directed cough in the treatment of the pathological conditions just sketched. As already mentioned, antimony and ipecacuanha, which control the circulation of the bronchial mucosa, also provoke cough; and a combination of these and salines, particularly potassium iodide, also increases the liquidity of the mucous flow, thus relieving the secreting glands and vessels and facilitating expectoration. Warm liquid food has a similar effect. Considerable tracts of pulmonary collapse are quite commonly released by a free expectoration. Sufficient clearance of the air-passages to last for a short time, and therefore possibly to save life in an emergency, may be effected by means of an emetic. If it be estimated that relief is so essential as to justify the temporary depression which attends vomiting, an emetic is justifiable when cough is ineffectual or failing and expectoration cannot be accomplished, as in infants, or when the anæsthetic effect of asphyxia is stealing over the patient.

Repair of the inflamed bronchi usually occurs spontaneously, and is promoted by attention to the other indications already examined. Much depends, however, on the nature of the cause at work; on the severity and degree of involvement of the bronchial wall; on the secondary changes in the alveoli

(inhalation, collapse, congestion, etc.), and on the constitutional condition of the patient. Under unfavourable circumstances, permanent damage of portions of the walls is the result, contributing to chronic bronchitis, emphysema, pulmonary fibrosis, tuberculosis, etc. Broncho-pneumonia is an occasional complication of an acute kind.

Clinical Indications.—A study of the clinical characters of acute bronchitis is of great importance in suggesting the proper objects of treatment. The phenomena of dyspnœa and cough in particular reveal to us details of the pathological process and its effects on the respiration and circulation which prove invaluable guides to the methods to be employed.

Dyspnœa is severe and continuous but not uniform, becoming paroxysmally aggravated. It is peculiarly laboured, consisting of prolonged efforts both in inspiration and in expiration, the shoulders being raised or orthopnœa actually present. The visible signs over the chest, neck, and epigastrium reveal difficulty of movement of the inspiratory wave in the bronchial passages, and the rhonchi suggest obstruction, partly continuous partly shifting, as the cause of this. The signs of pulmonary distension, the action of the muscles of extraordinary respiration, and the rhonchi are significant of expiratory difficulty. The lividity of the integuments and visible mucous surfaces, the pulse, the patient's sensations and the increasing disposition to cerebral dulness complete the clinical evidence of the interference with respiration as a whole, and the consequent involvement of the blood and circulation. We find in these phenomena the same urgent indication as was presented by the pathological condition—the swollen bronchial walls and the passages filled with tenacious frothy mucus—namely, to clear the air-way by reducing the swelling and removing the contents. But we find another, a parallel, indication. Whilst reducing or removing the necessity for exaggerated respiratory efforts, we have to enable the chest to work to the greatest possible advantage; to increase and maintain the vigour of the muscles and of the respiratory mechanism as a whole; and to prevent the dulling effect of asphyxia on the cerebral centres. The patient's posture in bed must be the most favourable for free

respiration: the shoulders raised, the back well supported, the front unencumbered by tight under-garments and heavy applications, the abdominal organs low (not driven or doubled up into the chest as happens when the patient slips down into the bed), the stomach and bowels kept free of flatus. Ammonia, strychnine, nourishment and alcohol, all chosen with judgment and discrimination, will be the best means of maintaining the respiratory functions under the severe strain. At the same time, their work must be turned to the best possible account by providing a proper atmosphere around the patient. The air of the room must be abundant, rich in oxygen and free from the impurities that proceed from the closeness of an apartment which, as we have previously seen, must be maintained at a relatively high temperature. There is here need for close attention on the part of the nurse, particularly to the state of the fire and windows.

When the condition of the bronchial passages, inefficiency of expectoration, weakness of the muscles or other tissues in the chest walls, failure of the respiratory centre, or difficulty in managing the atmosphere leads to grave and increasing interference with aëration of the blood, artificial assistance is called for and can be provided by administration of oxygen. At first sight it would appear that the problem of bronchial obstruction ought to be solved by this means. No doubt oxygen is perfectly successful for a time in simple bronchial stenosis. In bronchitis, however, the passages are blocked throughout their whole length and extent, and blocked not simply with mucus but with froth which the greatly enfeebled inspiratory wave of oxygen apparently cannot penetrate. The difference mechanically between the conditions in bronchitis and pneumonia helps to account for the greater success of oxygen in the latter disease. Notwithstanding these considerations, oxygen ought of course to be always given when indicated: it may do good and it cannot possibly do harm. Whilst efforts are being made in these different directions to relieve respiratory difficulty and distress, care must also be exercised not to compromise them by respiratory and circulatory depressants given for other purposes. Opium, which is otherwise indicated as we shall presently find, must be ordered

in distinct subordination to the greater vital indication which has just been discussed, the maintenance of respiration. Antimony and ipecacuanha, given as vascular depressants, manifestly must be employed with caution, but being also expectorant they contribute to clearing the passages.

Spasmodic breathing occurring in paroxysms calls for such remedies as ether and ammonia internally, and for inhalations.

Cough and expectoration in acute bronchitis illustrate very instructively the correct way in which clinical facts ought to be employed as guides to treatment, namely as symptoms or evidences of pathological conditions which may be different in different diseases or in different stages of one disease. We have seen in connexion with the pathology of acute bronchitis how dependent we are upon expectoration, both for maintenance of the air-way and prevention of secondary changes in the lungs and circulation. The value of cough in these respects, the immediate improvement which it effects on the condition of the patient, may be constantly appreciated by clinical observation, as has just been noticed in connexion with dyspnœa. There is therefore an obvious indication to promote cough and the freedom of expectoration. Very little consideration is required, however, to convince us that this is but a crude, incomplete and misleading statement of the therapeutic relations of cough in acute bronchitis. During the greater part of the illness cough requires no encouragement. On the contrary, it is usually violent and exhausting. What is equally important, it is at the invasion of the disease peculiarly harassing and yet dry or almost dry, that is, it ends without expectoration or with the discharge of very scanty, tenacious, possibly blood-streaked sputa. The significance of cough at this stage must be interpreted before treatment is ordered. It is provoked by hyperæmia, swelling and dryness of the tubes, as is sneezing in nasal catarrh. The correct indication is therefore precisely the opposite of the other: to allay if not entirely arrest what is useless, harassing, distressing and exhausting.

The rule with respect to cough therefore falls into a line or corresponds with the rule which has been already derived from a study of the pathology of bronchitis. In the early stage of

the disease it is to be met with circulatory depressants which shall at the same time stimulate bronchial secretion, thus relieving local tension, swelling, dryness and irritability, care being taken not to over-do the effect. Antimony, ipecacuanha, and the iodide and some other salts of the alkalis, have these actions; and so have warm drinks and simple moist inhalations. Therewith it is rational and safe to reduce excessive irritability of the air passages and respiratory centre by combining with these drugs small quantities of chloroform and even morphine. Obviously there is risk in this proceeding. We are tampering with the most fundamental of all the indications which we have found: the preservation of the respiratory function, which is unceasingly dependent on the activity of a great reflex centre. Narcotics must therefore when given for bronchitis be given for the first stage, in doses sufficiently large only to check harassing cough and consequent restlessness; it must be withheld or given with the greatest possible caution in persons who from age idiosyncrasy or disease are readily affected by it: and it ought to be stopped when the sputa begin to appear. It must on no account be given to produce sleep directly. The forms of opium given have usually been the paregorics, which contain opium in safe combination with camphor and other stimulants and aromatics. With the appearance of sputa, the disease enters on its second stage and the indication is now to promote expectoration of the abundant frothy discharge from the respiratory passages by diminishing its consistence and maintaining cough. By this time the pulse may be rising in frequency and losing tension, and the vigour of the heart be beginning to fail: evidences of a condition of circulation which calls for stimulation. The sedative expectorants are therefore changed for stimulant expectorants—squill, senega, ammonium carbonate and strychnine, variously combined. Still later, towards the favourable termination of acute bronchitis the cough may have once more to be arrested, when the respiratory tracts and centre are left weak and irritable. Mild tonic measures, whether medicinal or climatic, are then the best to employ; and this whether the sputa decline and disappear, or whether, as sometimes happens, they become excessive. In the latter event belladonna sometimes affords relief.

Throughout the whole of the treatment the heart must receive special consideration, involved as it is so much by the respiratory disturbance and disease. If it threaten to fail, several powerful remedies are available. Venesection or leeching is indicated in capillary bronchitis, or when from other causes or in other ways the right side of the heart becomes over-distended. Hypodermic injections of strychnine are invaluable under these circumstances; and alcohol as a rule has to be freely used.

The fever of acute bronchitis does not call for direct treatment of any importance.

There is need for nourishing food in acute bronchitis, to supply strength to the respiratory muscles, constantly being exerted in the effort of forced respiration and paroxysmally exhausted by violent cough, and to sustain the heart in the face of severe strain. At the same time the food has to be fluid, because of the anorexia; warm, to relieve the congested bronchi and stimulate the mucous glands; and non-flatulent, lest the diaphragm, heart and lungs be impeded in their movements. Thus far there would appear to be no great difficulty about arranging the diet in acute bronchitis. A practical difficulty does arise however when the disease occurs, as it not uncommonly does, in gouty subjects. There is here a contra-indication, to feed sparingly—more sparingly than the patient has been accustomed to be fed, particularly in the matter of alcoholic stimulants. In these subjects it is correct (but it may require courage) to reduce the amount of rich broth, to remove milk, and to interdict port and champagne when the patient is feeling "low" and faint and the relatives are anxious. We have seen that alcohol is often required, and a pure spirit is the best form.

Sleep is a subject of peculiar importance in the treatment of acute bronchitis. For reasons discussed when dealing with dyspnœa and cough, it must never be induced by direct hypnotics unless of the simplest and safest kinds, such as ammonium bromide. During the first stage the relief of the irritable dry cough permits short snatches of sleep. A similar effect follows a bout of cough and free expectoration in the second stage. When the course of the disease is unfavourable,

asphyxia developing, somnolence setting in, and cough becoming less frequent and more feeble, there is a plain indication to interrupt sleep, to rouse the patient, set him up in bed, feed and stimulate him, and provoke cough and expectoration. In these and in less severe cases physical examination of the chest should be practised daily, and amongst other methods auscultation during and after cough regularly employed. The different manner of treating a case of acute pneumonia in this respect will occur to the reader.

Elimination must be insured very strictly in acute bronchitis. The vascular excitement of the first stage, the venous congestion associated with respiratory obstruction, the labouring right heart, the flatulent bowels, and gout if present, are all relieved by purgation, which ought therefore to be practised at the commencement of the illness and repeated occasionally.

Indications from the Course.—The acute course of this disease calls for prompt, thorough, supporting treatment. Some cases are developed with such rapidity and intensity as to be called suffocative catarrh, and must be dealt with immediately by bleeding if death is to be averted. In the average subject, a favourable termination may be anticipated and reckoned on from the first; but, as we have seen under ætiology, the nature of the cause and predisposition have always to be fully estimated in individual cases, so that we may be prepared for immediate danger in the subjects of other diseases such as the specific fevers, rickets, and pulmonary, cardiac and renal affections, or for permanent damage of the bronchi in the weakly.

Other considerations to be kept before the mind in this connexion are that acute bronchitis has no definite duration; that its progress is irregular; and that it varies with a factor in its causation, which is perfectly uncertain and beyond our control—the weather. In these Islands at any rate, and particularly in places and seasons of fog, the weather of a single night may prove fatal, unless special precautions be taken, and often in spite of them. A course thus severe, uncertain and indefinitely limited suggests to us to cut it short; to leave nothing to expectancy; to be complete and thorough in the measures employed; to watch the development of the stages closely, and take advantage of every step

forward; and to guard against sudden aggravation or relapse by attention to the smallest details of general management. A difficulty is often felt, particularly with some acute cases, in passing a certain point towards recovery. Again and again the bronchitic patient recovers sufficiently to leave his bed, and is immediately taken with fresh catarrh; and thus his illness will run into months' duration in winter or early spring. The practitioner, repeatedly disappointed, feels peculiarly helpless, and disposed to lose heart. His therapeutic resources are taxed to the utmost; perhaps exhausted. Behind such relapses several causes may be at work: age, organic unsoundness, cardiac weakness, unfavourable weather and a disposition to asthma. If it can be safely accomplished, removal to a milder and drier climate should be tried, but the asthmatical element renders the selection of a place difficult and the advantage of the change uncertain. Very often the patient must be kept at home in bed for the winter months.

When acute bronchitis runs a short if severe course ending in convalescence, the usual measures are to be taken proper to the advance in the direction of recovery. The most suitable tonic is nux vomica combined with either ammonia or acids, according to the type of case. Change of air is highly desirable as soon as it can be safely undertaken, that the last trace of catarrh may be removed from the bronchi and lungs, cough and expectoration cleared away, and life in the open air resumed, and that the natural resistance of the bronchial wall may be perfectly restored, and thus recurrent catarrh or actual chronic bronchitis prevented. The climate selected will obviously depend on the season of the year and on the patient's means. Ordinarily it is mildly-tonic, such as is to be found on the South Coast of England or on the Mediterranean.

Outline of Practice.

I. Commencement of the Case.—*At first visit.—General Management and Nursing.*—Rest in bed. Room large, with free, open fireplace; temperature 60°-64° F. Ventilation without draughts. No gas burning. Steam kettle. Bed fitted with light curtains; bed-clothing warm but light; the

pillows high; patient reclining supported by them or a bed-rest, in semi-erect position (p. 371). Warm, but light and perfectly loose garments, including a flannel jacket. One or two nurses, day and night. *Diet.*—Warm fluids only. Two pints of milk and one pint of broth daily, in five ounce feeds, every two hours; in gouty subjects peptonised farinaceous foods made with water to replace one pint of the milk. Very hot lemon water drunk quickly. *Stimulants.*—Only if specially indicated. Patient to be gently roused for food at intervals of not more than two hours, night and day, and cough and expectoration encouraged if necessary by movement (p. 376). *Medicines.*—A purgative (p. 369) to be given at once: ℞ Hydrargyri Subchloridi B.P. [Hydrargyri Chloridi Mitis, U.S.P.] gr. iv.; followed in six hours by a saline purgative, such as Pulvis Sodæ Tartaratæ Compositus (Seidlitz Powder), or by a gentle aperient: ℞ Misturæ Olei Ricini ʒi-ʒii. [U.S.P. ℞ Olei Ricini ʒiii-ʒvi, Mucilaginis Acaciæ ʒiss-ʒiii, Aquæ Aurantii Floris ʒi-ʒii, Aquæ Cinnamomi ʒiiss-ʒv.]—A sedative expectorant and diaphoretic mixture (p. 369): ℞ Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ʒiv, Vini Ipecacuanhæ ♏x, Aquæ Chloroformi ad ʒi. [U.S.P. ℞ Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ʒiv, Vini Ipecacuanhæ ♏x, Aquæ Chloroformi ʒiv, Aquæ Destillatæ ad ʒi.] Every four hours. In gouty subjects add to mixture: Potassii Iodidi gr. iii; or ℞ Potassii Iodidi gr. iii, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Aquæ Camphoræ ʒi. [U.S.P. ℞ Potassii Iodidi gr. iii, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Aquæ Camphoræ ʒii, Aquæ Destillatæ ad ʒi.] Every four hours. *Applications to chest.*—Large, light, crushed linseed poultices to back and sides of chest: the first sprinkled with a little mustard. To be changed every three or four hours. Or turpentine stupe. Cotton-wool or other light warm tissue to front of chest. In children and weakly subjects, liniments of Camphor, Soap, Turpentine, or of Turpentine and Acetic Acid, to be rubbed into skin of chest and followed with light warm coverings.—*For the relief of special kinds of distress and danger.* A selection of combinations for harassing cough (see cautions, p. 374): (1) Add to mixture Tincturæ Camphoræ Compositæ B.P. [Tincturæ Opii

Camphoratæ U.S.P.] ♏xx, or Tincturæ Opii Ammoniatæ B.P. ♏xv. (2) ℞ Pulveris Ipecacuanhæ Compositi B.P. [Pulveris Ipecacuanhæ et Opii U.S.P.] gr. v. At 8 P.M. (3) ℞ Pilulæ Ipecacuanhæ cum Scillæ gr. v. [U.S.P. ℞ Pulveris Ipecacuanhæ et Opii gr. iii, Pulveris Scillæ, gr. i, Ammoniaci gr. i.] At 8 P.M.—For suffocative attacks (pp. 370, 373): In children, an emetic: ℞ Vini Ipecacuanhæ ʒi. At once; to be repeated every 15 minutes until it vomits. In adults, (1) an emetic: ℞ Ammonii Carbonatis gr. xxx, Aquæ tepidæ ʒii. At once. (2) Venesection to 10 or 15 fl. oz.—An antispasmodic mixture for paroxysmal dyspnœa: ℞ Spiritus Ætheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii ♏xx, Aquæ Camphoræ ad ʒi. [U.S.P. ℞ Spiritus Ætheris ♏xxx, Spiritus Ammonii Aromatici ♏xxx, Tincturæ Aurantii Amari ♏xx, Aquæ Camphoræ ʒii, Aquæ Destillatæ ad ʒi.] When required.—For urgent and persistent dyspnœa with increasing lividity, weakness of cough, cessation of expectoration, failure of pulse, and sopor (pp. 372, 375): (1) Abstract blood at once by means of 6 to 12 leeches or venesection (8-10 fl. oz.); or cup between scapulæ to 4 fl. oz. (2) Give the above anti-spasmodic mixture every half-hour or as required. (3) ℞ Liquoris Strychninæ Hydrochloridi ♏iii. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏v-x]. To be given hypodermically at once, and repeated every 4 hours. (4) Oxygen to be inhaled.

II. PROGRESS OF THE CASE.—1. *At the second visit and subsequently.*—Continue the same treatment until sputa appear (p. 374). Occasional purgation is beneficial (p. 376). 2. *When sputa appear.—General Management and Nursing.*—As before. *Diet.*—As before, or with farinaceous thickenings of milk; yolk of egg. *Stimulants*, if indicated. *Medicines.*—Substitute for sedative expectorant a stimulant expectorant mixture (p. 374): ℞ Ammonii Carbonatis gr. iv, Vini Ipecacuanhæ ♏v, Tincturæ Scillæ ♏xx, Infusi Senegæ ad ʒi. [U.S.P. ℞ Ammonii Carbonatis gr. iv, Vini Ipecacuanhæ ♏v, Extracti Scillæ Fluidi ♏iv, Infusi Senegæ B.P. ad ʒi.] Every four hours. For relief of distress and for dangerous developments; as before. Purgatives, occasionally as before. *Locally:* Stop poultices and liniments, and use light warm coverings only.

3. *As the disease subsides. General Management and Nursing.*—Patient may move more freely and lie lower in bed. Stop steam kettle. Remove bed curtains. *Diet.*—Farinaceous foods, lightly boiled eggs, fish. *Stimulants*, as indicated. *Medicines:* A respiratory, nervine and digestive stimulant or tonic (p. 377): ℞ Ammonii Carbonatis gr. iii, Tincturæ Nucis Vomicæ ♏v, Spiritus Chloroformi ♏x, Infusi Quassiæ ad ℥i. [U.S.P. ℞ Ammonii Carbonatis gr. iii, Tincturæ Nucis Vomicæ ♏v, Spiritus Chloroformi ♏x, Infusi Quassiæ B.P. ad ℥i.] Three times a day, 5 minutes before meals. Purgatives as required.

4. *Convalescence.*—Patient sits up; change to mildly bracing climate. See p. 377. Prevention of recurrence and of chronic bronchitis (p. 377). *Food.*—Ordinary, nutritious. A little sound wine with meals. *Medicines.*—An acid tonic mixture: ℞ Acidi Nitro-hydrochlorici Diluti ♏x, Liquoris Strychninæ Hydrochloridi ♏iv, Syrupi Aurantii ℥i, Aquæ ad ℥i. [U.S.P. ℞ Acidi Nitro-hydrochlorici Diluti ♏x, Strychninæ Hydrochloratis gr. $\frac{1}{28}$, Syrupi Aurantii ℥i, Aquæ Destillatæ ad ℥i.] Three times a day, after meals.

CHAPTER XVI.

CHRONIC BRONCHITIS.

It is well that the student should learn to appreciate that there are limits to the success of rational treatment, and the subject of chronic bronchitis is calculated to enable him to do so. Few chronic diseases consisting in what might be said to be simple anatomical change are more unpromising therapeutically. He will find how chronic inflammation, ulceration, degeneration and loss of elasticity, the prominent elements of the pathological process, defy treatment when they occur in unfavourable situations and in certain subjects; and how the repair which accompanies them may not only be in vain, but also exhibit serious defects in consequence of the unfavourable influence of the anatomical structure and the functions of a part and of the conditions under which they work.

At the same time the hopelessness of actually reparative treatment will serve to impress on the student the urgent necessity and proper employment of nutritive and palliative treatment in chronic disease characterised by constant waste and suffering.

Ætiological Indications.—*Preventive Treatment.*—The importance of thoroughness and completeness in the treatment of acute bronchitis for the purpose of preventing the disease from becoming chronic has been already studied. It ought never to be forgotten that one definite mode of origin of the chronic form is a single severe acute attack. More commonly, however, chronic bronchitis originates slowly, in connexion with occasional attacks of subacute bronchial catarrh

which recur again and again, with or without an asthmatical element, at every change of weather or on any licence in living, and finally become continuous or practically persistent. When this form of the disease threatens to develop, the prophylactic indication is to send the patient to a genial climate and to attend to diathetic predisposition, particularly gout. The whole personal hygiene ought to be planned on the principles proper for gout; and it may be as useful to send the patient to Mont Dore or Royat in summer for the arsenical waters and other measures employed there as to the Mediterranean in winter. Most persons will of course have to remain at home; and these must be protected as far as possible from the inclemency of the climate.

Remedial Treatment.—Although the origin of a case of chronic bronchitis is already an affair of the past, the chronicity being due to damage of the bronchial walls, the indication still exists to remove or mitigate influences recognised as injurious to the mucous membrane. These are especially atmospheric and other climatic conditions. The subjects of chronic bronchitis must clothe warmly, and avoid cold and damp air and exposure generally. In unfavourable seasons they may have to keep indoors or seek a milder climate; advantage being derived in this way from continuousness of treatment. For younger subjects this may mean either change of occupation, change of abode or actual emigration. The Mediterranean, Egypt, Grand Canary, Teneriffe, the West Indies, parts of South Africa, Ceylon, India and the more equable climates in Australasia afford a considerable choice in this respect, and there are others besides. Amongst the poor there is the twofold difficulty in being able to make such a change, and in giving up occupations which are the chief causes of their troubles through the agency of dust, such as milling, baking, knife-grinding, etc. Again, in some subjects it is more important to protect them against the influences of summer, mainly or solely pollen, than of winter.

Associated affections of the lungs, including emphysema, fibrosis, and tuberculosis, and of the heart, arterial system and kidneys must be fully respected in planning treatment. In the familiar type of the disease known as chronic bronchial catarrh, which is often spasmodic, diathetic causes have to

be strictly controlled by employment of the same measures as are indicated in the attempts at prevention. In England the gouty disposition must never be overlooked; and in spite of certain indications to the contrary, spare living, abstinence from alcohol, unless in the strictest moderation and in the most approved forms, regulation of the liver and bowels, scrupulous attention to the action of the skin by means of soap baths, and daily exercise in a mildly bracing dry atmosphere if possible, ought all to be insisted on. Potassium iodide in combination with alkalis fulfils an obvious indication in these subjects with satisfactory results; in exacerbations of the bronchitis colchicum might be tried.

Pathological Indications.—The task before us in the treatment of fully developed chronic bronchitis, as far as it is indicated by a study of the pathological changes in the bronchial walls and associated parts, appears a nearly hopeless one. It is nothing less than to subdue chronic inflammation of an extensive mucous membrane, to repair ulcerated areas, to promote absorption of thickenings of the tubes, to restore muscular tone and elasticity in the walls of the bronchi and in those of the chest; to undo secondary changes in the lungs and circulation; and to do all these in organs which cannot rest, in tubes which are specially constructed to resist closure, and in subjects who are always debilitated and frequently unsound. Very few, if any, of these objects can be perfectly attained, but some of them can be approached, and the advance of the process retarded if not arrested.

The first pathological indication is to improve the nutrition of the tissues generally and the state of the blood. Food must be thoroughly nutritious, and well digested and assimilated; the diathetic proclivities which are so often present being studiously regarded in ordering it. Stimulants must be allowed with equal discrimination. Cod liver oil benefits some types of the disease. Tonic medicines that are at the same time stomachic and respiratory stimulants are to be found in nux vomica and ammonium carbonate. The other invigorating measures so useful in chronic inflammatory diseases, namely, fresh air and moderate exercise, are furnished by well-chosen climates. Climatic treatment is ordered for chronic bronchitis not because

of its warmth—warmth could be obtained at home in bed—but because, being genial, it permits a fair amount of outdoor exercise daily.

The next object from the pathological point of view is to relieve the congested and atonic blood-vessels of the bronchial wall. Saline expectorants, which promote watery discharge, ought to have this effect; and stimulant expectorants, such as squill and serpentary, will promote the activity of the heart and accelerate the flow from the bronchial veins. Terebinthinate and other aromatic compounds, whether given by the mouth or inhalation, probably exert part of their useful action in this way. Counter-irritation over the front and back of the chest, once much in vogue, is now rarely employed excepting in subacute exacerbations.

Expectorants, which liquefy the bronchial "secretions" and strengthen the heart, promote at the same time the fulfilment of the next indication, removal of the products. This is always an important object in chronic bronchitis, as discharge has to be effected against gravitation and in spite of serious reduction of the muscular vigour and elasticity of the tubes, the alveoli and the chest walls. There is here abundant opportunity of employing ammonium carbonate and chloride; potassium iodide and bicarbonate; squill, senega and digitalis; camphor, benzoin, tolu, and preparations of tar, turpentine and their allies; strychnine, and other familiar drugs. Tobacco-smoking and fuming preparations, when they are properly used, often produce speedy and thorough clearance of the respiratory passages. By quickly stimulating the mucous glands of the bronchi, warm liquid food has a similar effect,[1] particularly in the early morning when the passages are relatively dry and the secretions inspissated and in severe attacks of cough and dyspnœa during the night.

In more advanced cases, and in senile subjects with atony and dilatation of the bronchial tubes and bacterial decomposition of the residues within them, disinfection must also be practised. As well as stimulating expectoration, many of the drugs just mentioned have this action. Asafetida, ammoniacum

[1] Watney, "The Minute Anatomy of the Alimentary Canal," *Phil. Trans.*, London, 1876.

and copaiba, once much used for this purpose, are now mostly replaced by creosote, guaiacol, phenol, and more elegant preparations of tar, given internally; whilst intra-laryngeal injections of guaiacol, menthol, and other disinfectants are quite well borne and frequently successful when the bronchi are dilated. It need hardly be added that the proper employment of climate, to which reference has just been made, is another invaluable means of disinfecting the air-passages.

Clinical Indications and Indications from the Course. —The clinical characters of chronic bronchitis suggest that instead of the preservation of the patient from death by asphyxia, as in the acute form of this disease, our principal aim here must be to arrest the deterioration of health, the debility, and the wasting which are induced by the muco-purulent discharge, harassing cough, respiratory and circulatory impairment, and serious interference with exercise and alimentation. Most of the measures recommended above as calculated to control the pathological processes within the bronchi also promote vigour of constitution; and indeed, as we have seen, they act mainly in this way. We refer to feeding, exercise, ventilation in the fullest sense of the term, and the use of tonics.

Passing discomforts of many kinds may call for simple remedies. Paroxysms of dyspnœa, cough and difficult expectoration usually yield to antispasmodics, compounded of ethers, chloroform, sal volatile, different aromatic tinctures, belladonna or stramonium, lobelia, etc.; to warm moist inhalations; or to the use of smoke. Attacks of subacute or acute catarrh or bronchitis must of course be promptly attended to; as well as manifestations in every form of associated diseases, such as gout, asthma, cardiac disease and nephritis. There is no longer any doubt but that tubercle bacilli are present in a considerable number of the cases of what a few years ago was called chronic bronchitis. In some instances tuberculosis appears to be engrafted on the diseased bronchial walls, a fact pregnant with suggestions; in other instances "chronic bronchitis" is tuberculous from the beginning.

Outline of Practice.

General Management (p. 382). — Comparative freedom from work and exposure. Reconsideration of occupation. Warm light woollen clothing. Confinement to house in cold and damp weather and after sunset. Climatic treatment in winter and early spring at Torquay, Bournemouth, Ventnor, Hastings, Falmouth, Penzance, Minehead, or other place on English Coast; on the Riviera or at other Mediterranean resort; in Egypt, Grand Canary or Teneriffe; in different British Colonies; in Southern California or Florida in the United States. In summer a visit to Royat or Mont Dore (p. 382).—*Diet.*—Nutritious but light solids (p. 383): fish, tender mutton, chicken, game, eggs, farinaceous foods; flatulent, bulky and "gouty" foods to be avoided (p. 383). Chief meat meal in middle day. Warm fluids or semi-solids for supper. Warm milk or broths with small stimulants if paroxysms of cough and dyspnœa occur during the night. *Stimulants*, as indicated by pulse, appetite, etc., chiefly in form of pure spirits, controlled by associations of gout, gravel and renal disease (p. 382).

Medicines. — Stimulant expectorant mixtures (p. 384): (1) ℞ Ammonii Carbonatis gr. iv, Tincturæ Scillæ ♏xx, Infusi Serpentariæ ad ℥i. [U.S.P. ℞ Ammonii Carbonatis gr. iv, Extracti Scillæ Fluidi ♏iv, Infusi Serpentariæ B.P. ad ℥i.] Four times a day, between meals. (2) ℞ Ammonii Chloridi gr. x, Extracti Glycyrrhizæ Liquidi ℥i, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Ammonii Chloridi gr. x, Extracti Glycyrrhizæ Fludi ℥i, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Three times a day, between meals.—*For a gouty element.* An alkaline iodide expectorant mixture: ℞ Potassii Iodidi gr. iii, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Potassii Iodidi gr. iii, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Aquæ Camphoræ ℥ii, Aquæ Destillatæ ad ℥i.] Three times a day, three hours after meals.—*A stomachic, respiratory, cardiac and general tonic mixture:* ℞ Ammonii Carbonatis gr. iv, Tincturæ Nucis Vomicæ ♏v, Spiritus Chloroformi ♏x, Infusi Quassiæ B.P. ad ℥i. Three times a day, five minutes before

meals.—Terebinthinate and other *disinfectant and stimulant compounds* (p. 384): (1) ℞ Misturæ Creosoti ℥i. [U.S.P. ℞ Creosoti ♏i, Spiritus Juniperi ♏i, Syrupi ʒi, Aquæ Destillatæ ad ℥i.] Three times a day, three hours after meals. (2) ℞ Terebeni ♏v. In capsule or on sugar, when cough is severe. (3) Misturæ Ammoniaci B.P. [Eumulsionis Ammoniaci, U.S.P.], ℥i. Three times a day, three hours after meals.—*For attacks of paroxysmal dyspnœa and cough:* An antispasmodic mixture: ℞ Spiritus Ætheris ♏ xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii ♏xx, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Spiritus Ætheris ♏xxx, Spiritus Ammonii Aromatici ♏xxx, Tincturæ Aurantii Amari ♏xx, Aquæ Camphoræ ʒiv, Aquæ Destillatæ ad ℥i.] When required.—A sedative inhalation: ℞ Terebeni ♏xxx, Magnesii Carbonatis Levis gr. xx, Aquæ ferventis Oss. As an inhalation.—A counter-irritant to chest: ℞ Linimenti Chloroformi ʒiv, Linimenti Terebinthinæ Acetici ℥iii. [U.S.P. ℞ Linimenti Chloroformi ʒiv, Olei Terebinthinæ ʒxi, Acidi Acetici Glacialis ʒii, Linimenti Camphoræ ʒxi.]

CHAPTER XVII.

ASTHMA.

The dominant feature of asthma in all its relations is the personal factor; and the disease accordingly illustrates the art rather than the science of treatment. In no disease is the importance of attention to the individual patient and his peculiarities more strongly impressed upon us than it is in bronchial asthma. We shall find that an influence of the most common every-day kind, such as the odour of a familiar flower or animal, a somewhat indigestible meal, a passing worry, or slight interference with the elimination of uric acid, may become an efficient cause of disease, or at least of disturbance of the vital functions, in certain individuals, simply because of their extreme personal predisposition. This striking feature of the affection influences the whole of the treatment, which has to be conducted largely on the principle of personal observation and control. Asthma will also serve as an instructive example of the proper use of palliative treatment. But whilst the indication for palliative treatment is very urgent as well as rational, it is very readily and, as a matter of fact, almost universally abused by patients; and we shall see how the practitioner may find it difficult to control his patients and prevent them from indulging in nostrums and contracting drug-habits whilst neglecting the most elementary rules of physiological living.

Ætiological Indications.—*Preventive Treatment.*—Asthma as a rule is not anticipated until the first evidences of it present themselves. Then it actually exists. More might be done perhaps to prevent asthma in children with family predisposi-

tion to gout, gravel, asthma and neuroses in general, were the personal factor less inscrutable. It is fortunate that the careful management which young persons with this inheritance always require in respect of feeding, clothing, bowels, skin and the state of the urine, as well as of their education, is calculated to prevent the development of the disease. The influence of weather, climate and soil on such children ought to be observed carefully as often as they are taken from home to the sea, to the mountains, etc., and experience gained which could be turned to useful account should the question of the locality of a school ever come to be raised in a practical form.

Remedial Treatment.—The efficient causes of asthma, if they can be discovered in the particular case before us, have to be removed, arrested, counteracted, altered or avoided. Lesions of the upper respiratory passages, bronchi and lungs must receive attention: polypus, adenoids, enlarged tonsils, enlargement of the bronchial glands, bronchial catarrh, plastic bronchitis, emphysema, chronic pneumonia, pleuritic adhesions and the consequences of these. The details of such treatment do not require discussion here. Another set of causes which must be sought and dealt with are the poisons that act specifically on the bronchial mucous membrane. One set of these come from without, such as odorous particles in connexion with flowers, fruits and animals; pollen; dust of many different kinds; and certain drugs, such as tobacco and ipecacuanha. A second series of these poisons are intrinsic in origin, the products of disturbed metabolism which are comprehensively and conveniently designated "uric acid," one and probably the chief of the series. There can be no doubt but that, in England at any rate, attention should be directed to uric acid and the gouty diathesis in the prevention and rational treatment of the majority of cases of asthma. Asthma, in other words, is one of the many forms or manifestations of irregular gout, alternating with arthritis, eczema, acid dyspepsia, biliousness, gravel, sick-headache, insomnia and the like; and appearing in successive generations and at all periods of life, including childhood, in gouty families. We find here the indication for the chief part of the treatment, prophylactic and remedial, of this disease. When

asthma is actively recurrent, treatment must begin with a smart mercurial purge, or with a course of Plummer's pill, followed in the morning with salines. At the same time a combination of potassium iodide and bicarbonate and ammonium carbonate in camphor water is to be ordered. When the activity of the attacks has been overcome, arsenic ought to be substituted for the iodide; and in these subjects the waters of Royat or Mont Dore fulfil the indication. The treatment for gout is carried out further by reducing the quantity of food and simplifying it in kind as we shall see presently. Wines should be avoided, and pure spirits such as Hollands or unsweetened gin ordered instead.

Amongst the efficient causes of asthma unfavourable meteorological and climatological conditions as a whole have always to be reckoned with in planning preventive or remedial treatment. The climate and locality in which the patient is to live, or to which he is to repair temporarily in the hope of benefit, are subjects on which we are expected to speak definitely. People of both sexes with sufficient means and no great ties at home will desire to be recommended to suitable quarters during the winter months and other trying seasons, or during summer if they suffer from hay-fever. Other asthmatics, whose circumstances do not permit so complete or prolonged a change as this, are frequently sent for a few weeks to a health resort. Most important of all, however, in this respect is it to determine the proper management of asthmatic children by climatic means, that is, to plan the rearing and education of an asthmatic subject during the years of childhood and adolescence and with full respect to the sex, social position and future prospects of the patient. Under either of these sets of circumstances the principles that ought to guide us in offering advice with respect to climate in the treatment of asthma may be stated as follows:—

The individuality of the patient must always be first considered as one of the chief predisposing causes of asthma. The problem is a personal one; and personal experience of the effect of climate on the asthma is therefore our best guide. It is quite unsafe to conclude that because the climate of a particular place is mild or dry or sunny, or the like, it will

agree with the particular asthmatic before us. Even if it be known to benefit the majority of asthmatical subjects, or have suited relatives of the patient, it cannot be recommended with any confidence to the individual. The only way to determine whether a climate will benefit our patient is for him to make the experiment by trying it.

We ought to begin the observation as near the patient's home as possible. We never send him far away at first. This rule is based on an obvious principle: since we cannot insure the success of the change of climate, we do not subject the patient to the trouble incident to a long double journey. It is unwise, for instance, to begin with a visit to the Colonies or even to the Continent, unless a series of places can be tried there, for example, the different towns on the Riviera. Still more hazardous and unwise is it to recommend a voyage as the first experiment in climatic treatment. For boys, of course, we have usually to find a suitable school in their own country. In making a selection near home we first recommend a trial of places of repute, such as Bournemouth or Ventnor, rather than unknown places. Next, it is desirable that the place tried should possess well-marked characters: on the coast; on the moor; thoroughly dry, or more moist. The effect will be definite, and must be accurately noted and recorded. If the place disagree, another place of opposite character should next be tried: the coast after the mountain, for instance, or *vice versa*.

In attempting to find a suitable place we might recommend a trial of one which possesses in itself a variety of climatic influences. Thus, at Bournemouth there are at least three local sub-varieties of climate; at Ventnor the different elevations have distinctly different effects on asthmatics; on the Riviera places of different exposures and qualities otherwise are in convenient proximity.

In the case of boys, who constitute a considerable proportion of asthmatics, one cannot begin too early to try to discover a place where they can be sent to school with fair prospect of immunity from attacks. They should be definitely taken for visits to different parts, following the system of selection just recommended, and necessarily always with a view

to the fitness otherwise of the locality for their education and upbringing. The careers of very promising lads at public schools may be sadly interfered with by asthma unless this reasonable course be followed.

Having found a suitable place, the patient, whether child or adult, should remain there as long as possible until the disposition to attacks is overcome or greatly weakened; or, if this be impossible, he ought to repair to it as frequently as circumstances permit. If it come to disagree with him later, as unfortunately may occur, he must change his quarters; and happily in some of these instances he may be able now to return home and keep well.

Food, feeding and indigestion have much to account for in the causation of asthma. Indigestible articles of every description, including milk in gouty subjects, must be strictly forbidden, whether they produce flatulence with its immediate effect on the chest physically, or acidity with its reflex and remote actions, or whether they lead to gout as we have already seen. Heavy meals should be avoided: dinner should be taken at the usual hour for luncheon, and only a light farinaceous dish or a small quantity of fish, chicken or game eaten for supper, at least three hours before bedtime.

Asthma is in its very nature a nervous disease, a disorder of a great and very sensitive neuro-muscular mechanism; and reflex and direct cerebral disturbances occupy a leading place in its ætiology, both as regards constant proclivity and the incidence of individual paroxysms. This introduces us to the subject of predisposition. It is from deficient resistance that the disorder essentially proceeds. All of us are exposed to the efficient causes of asthma; but happily only a few are burthened with this predisposition—a nervous system morbidly keen, a bronchial mucosa morbidly sensitive, a family or a personal disposition that responds to degrees or kinds of respiratory stimulation which do not disturb the average healthy individual. Asthma is but one of many disabilities of a similar kind which we meet with in human pathology. In this respect, when regarded as a disease, it resembles irritable heart, nervous dyspepsia, nervous diarrhœa, nervous polyuria; very possibly some types of glycosuria and hepatic disorders in

certain subjects; a class of cutaneous disturbances characterised by blushing, urticaria, etc.; and of course many familiar neuroses proper. The most obvious indication founded on these facts is to caution and insure the patient against excitement. In a large number of instances asthmatics are highly neurotic; suffer intermittently or alternately from other functional disorders, such as neuralgia, insomnia, or mental instability; are disposed to be intractable and rebellious when well, and to be overwhelmed by illness; are apt to fly to every description of "cure," and to drift into habits of smoking cigarettes, inhaling fuming powders, and taking chloral hydrate, morphine or alcohol. It is obvious that the management of asthmatics of this type, a not uncommon one, calls for the exercise of great judgment, tact and firmness. In particular they must be made and kept obedient; be taught that the prevention of asthma lies mainly in conformity to simple but definite rules of living; and renounce the use of specifics, which afford but temporary relief, often at the risk of much future evil and distress. Gouty predisposition has been referred to already.

Another peculiar predisposition has to be enquired after before the treatment of asthma can be rationally undertaken from the ætiological side, namely the catarrhal diathesis or special proclivity to catch cold in connexion with the mucous membranes or skin. The subjects of this diathesis very readily become overheated by exertion or even exercise, perspire freely, and on halting quickly feel a chill. An effort must be made to reduce this susceptibility to catarrh in the asthmatic, by ordering regular exercise without effort, lighter clothing, avoidance of coddling, and a more bracing mode of life generally, the guide for the patient to follow being diminished readiness to sweat. An invaluable adjuvant to this end is the soap bath, taken regularly every morning.

Pathological Indications.—Spasmodic asthma is a functional disease, and presents very few pathological indications of a direct kind. The different structural changes in the respiratory organs associated with it are mainly either of the nature of causes, for example nasal polypus, as we have already discussed; or of the nature of effects, including emphysema and cardiac

dilatation. Even bronchial catarrh and Curschmann's bronchiolitis, which might be regarded as representing the pathological characters of asthma in some instances, are more strictly causes, and furnish indications which fall under the preceding head. One important lesson, however, is to be learned from these considerations, namely, that the pathological effects of asthma on the lungs and heart are to be prevented by checking the disease early and by reducing the frequency and severity of the seizures.

Clinical Indications.—The clinical indications of spasmodic bronchial asthma are only too obvious and prominent. The severity of the dyspnœa suggests immediate relief as the first consideration; and the success of symptomatic treatment, the paroxysmal character of the attack as a whole, and the freedom from distress between the seizures combine to concentrate the attention of the patient and even of the practitioner on methods of a purely sedative and antispasmodic kind. The result is unfortunate—neglect of the many fundamental indications derived from ætiology, and abuse of "ready" measures.

The asthmatic paroxysm demands antispasmodics: but the paroxysm is only part of asthma, and antispasmodics are but a small part of the treatment of the disease which must be systematically ordered. The use of any measure for immediate relief should follow the following rules: that it be associated with attention to the cause or causes, never constituting the sole treatment employed; that it be occasional in its employment, that is, directed only to the relief of an attack when it threatens or commences, not continuous or at regular intervals between attacks; that the means employed, whilst sufficiently powerful, shall be given in the smallest useful doses, shall have the fewest other effects of an unfavourable kind, immediate and remote, and shall not be liable to engender habits of drugging. The means which fulfil these conditions are chiefly ether, ammonia, the nitrites and nitro-glycerin, coffee, inhalations of warm medicated vapour, and counter-irritation to the chest. Any of these may be safely employed the moment the patient is aware of an impending attack, and can be safely repeated at short intervals as may be necessary. The addition of a small dose of antimonial or ipecacuanha wine sometimes hastens the

flux, provokes cough and expectoration, and thus brings relief. Another important group of remedies for the asthmatical paroxysm appear to act by developing very rapidly the crisis of the attack, which is thus as it were violently broken and ended. These are fuming-powders and papers and cigarettes, the smoke of which is inhaled. They are composed of nitre, tobacco, and various combinations of such powerful antispasmodic drugs as stramonium, belladonna, hyoscyamus and opium. There can be no question of the relief immediately afforded by these preparations in many instances. Unfortunately many serious drawbacks attend their employment, in opposition to the conditions which we have just laid down to be observed in the employment of measures for relief. Many asthmatics abuse them greatly and suffer in consequence. They are never free from the influence and odour of these powerful drugs. They sleep in an atmosphere of fumes which they prepare for themselves before retiring to bed. During the day they smoke cigarettes. Their digestion is disordered, the bowels are confined, the pulse is soft and hurried, the nervous system greatly disturbed, the mind anxious and irresolute, the patient a slave to the habit which has grown upon him. In order to secure the use without the abuse of these powerful means, we should give clear instructions to the patient as to the circumstances which call for them and in which alone they are to be employed, warn him of the results of departure from our rules, and appeal to his intelligence by dwelling on the importance of the radical part of the treatment. The difficulty is to persuade persons of neurotic temperament to adhere patiently to the slower and less striking system. They listen to the first fellow-sufferer they meet and try the cure which he recommends. It is in this phase of their complaint that a considerable proportion of asthmatics come under our observation, and we learn to appreciate the importance of the personal factor. In some obstinate cases another plan may be followed to lessen the risk of abuse of these powerful antispasmodics the solanaceous drugs, namely to prescribe extracts of stramonium, belladonna or hyoscyamus combined with potassium iodide and bicarbonate in mixtures which the patient will seldom be found to take

in excess, however inconsiderately he might smoke stramonium cigarettes. The use of compressed air and oxygen is theoretically indicated in the asthmatical paroxysm, but cannot be said to be at all general.

Indications from the Course.—The essentially recurrent, chronic and obstinate course which asthma runs taxes the patience and resources both of the sufferer and of the practitioner, and is partly accountable for the lapses in system of which they are often guilty, and to which we have sufficiently referred. The endless variations of climate and weather, the nervous disturbances, the temptations to exceed or at least to be free in the matter of eating and drinking, the recurrent risk of being upset by change of surroundings in the holiday season—these are but some of the commonest causes of fresh attacks, extending over years. The emphysema and catarrhs attending and left by the asthmatic seizures tend to aggravate and perpetuate the disease; and in some subjects grave pulmonary lesions and cardiac dilatation are developed, of which they may ultimately perish. In the light of results like these, as well as of the immediate suffering which attends it, we would again insist on the importance of treating asthma early, radically and consistently.

Outline of Practice.

I. Preventive Treatment; and in Intervals of Attacks. —*General Management.*—Selection of occupation, in relation to the disease, to age, to means, etc. (p. 390). Residence and climate: rules in respect of (1) patient's home, (2) occasional change, and (3) school for young subjects (see p. 391). Regular daily exercise. Spa treatment: Royat or Mont Dore (May-October). *Local treatment.*—Surgical or other attention to nose, pharynx, tonsils, etc. (p. 389). *Diet.*—Spare, digestible, non-flatulent, excluding excess of meat and milk. Last meal of day to be particularly light (p. 392). *Stimulants:* none, or in form of pure spirit and water if otherwise indicated (pp. 390, 393). *Clothing:* warm but light. Daily soap bath (best taken on rising):—water bath at 90° F.; the whole body *lathered* with soap and water, and allowed to remain so for

several minutes; then a single large spongeful of colder water or a short douche; finish with hard towelling. *Medicines.*—(1) an alkaline iodide mixture to prevent, abort, or control attacks (p. 390): ℞ Potasii Iodidi gr. i-iii, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Aquæ Camphoræ ʒi. [U.S.P. ℞ Potassii Iodidi gr. i-iii, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Aquæ Camphoræ ʒii, Aquæ Destillatæ ad ʒi.] Three times a day, three hours after meals. (2) When frequency and severity of attacks have diminished, order an arsenical mixture, to be taken with intermissions for at least two months, the strength being cautiously increased (p. 390): (*a*) ℞ Liquoris Arsenicalis ♏iii-x, Tincturæ Cardamomi Compositæ ʒss, Aquæ Chloroformi ad ʒi. [U.S.P. ℞ Liquoris Potassii Arsenitis ♏iii-x, Tincturæ Cardamomi Compositæ, ʒss, Aquæ Chloroformi ʒiv, Aquæ Destillatæ ad ʒi.] Three times a day immediately after meals. (*b*) ℞ Liquoris Arsenicalis ♏iii-x, Ammonii Carbonatis gr. iv, Tincturæ Nucis Vomicæ ♏v, Spiritus Chloroformi ♏v, Aquæ ad ʒi. [U.S.P. ℞ Liquoris Potassi Arsenitis ♏iii-x, Ammonii Carbonatis gr. iv, Tincturæ Nucis Vomicæ ♏v, Spiritus Chloroformi ♏v, Aquæ Destillatæ ad ʒi.] Three times a day, immediately after meals.

II. Palliative Treatment during Attacks.—In many instances "asthma" is really recurrent bronchial catarrh, demanding treatment in bed (see p. 390). For ordinary asthmatic seizures:—(1) Respiratory antispasmodics (p. 394): (*a*) ℞ Spiritus Ætheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii ♏xx, Aquæ Camphoræ ad ʒi. [U.S.P. ℞ Spiritis Ætheris ♏xxx, Spiritus Ammonii Aromatici ♏xxx, Tincturæ Aurantii Amari ♏xx, Aquæ Camphoræ, ʒii, Aquæ Destillatæ ad ʒi.] When spasm is imminent or severe. (*b*) ℞ Tincturæ Lobeliæ Æthereæ ♏xv, Spiritus Ætheris ♏xx, Aquæ Camphoræ ʒi. [U.S.P. ℞ Tincturæ Lobeliæ ♏xv, Spiritus Ætheris ♏xxx, Aquæ Camphoræ ʒiv, Aquæ Destillatæ ad ʒi.] Every half-hour until nausea is induced. (*c*) ℞ Potassii Iodidi gr. iii, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Extracti Stramonii gr. $\frac{1}{8}$, Extracti Glycyrrhizæ gr. ii, Aquæ ʒi. At once, and repeated in two hours if necessary. (2) A fuming powder: ℞ Potassii Nitratis gr. 120, Anisi

Fructus gr. 120, Stramonii Foliorum gr. 240, Tabaci Foliorum gr. 5. The smoke to be inhaled (see cautions p. 395). (3) Other means: Cigarettes of Stramonium, Datura tatula and Cannabis indica. Nitrated papers. Administration of chloroform by practitioner or nurse. Morphine hypodermically under special circumstances (p. 393). ℞ Amyl Nitritis ♏iii. To be inhaled from a crushed capsule. ℞ Sodii Nitritis gr. i, Aquæ ℥i. Strong black coffee, without milk or sugar, on an empty stomach.

CHAPTER XVIII.

ACUTE PLEURISY.

Acute pleurisy, whether dry, serous or purulent, presents many features of great interest to the therapeutist. It originates in a variety of causes, local and constitutional, which must be differentiated and which demand a considerable share of attention. Repair, localization, and phagocytosis are found at work in it. The evil effects of retention of products is illustrated by it occasionally; but happily the ultimate removal of them, whether solid or fluid, by spontaneous provisions, is the rule. As long ago as the beginning of the century, Laennec wrote that in this as in most other acute diseases the unaided resources of nature are very great, and that the greater number of pleurisies, if left to themselves, would do well.[1] Even pus is sometimes evacuated automatically, internally or externally; but whether purulent or sero-fibrinous, and however successful its disappearance, the exudate usually disables in some degree a portion of the lung and parietes, thus affording strong suggestions for the timely interference of the surgeon. Some of the most striking clinical phenomena of pleurisy prove to be manifestations of natural efforts at relief, mainly by means of rest. Lastly, whilst in the vast majority of cases it tends to a spontaneous recovery, the terminations of acute pleurisy are exceptionally important, in consequence of the frequency with which pulmonary tuberculosis appears to develop, the truth being that the pleurisy had been but the first phase in the history of this grave disease.

[1] "Diseases of the Chest and Mediate Auscultation," Forbes's Translation, 1834, 4th ed. p. 437.

Ætiological Indications.—Acute pleurisy, whether dry pleurisy or pleurisy with effusion, presents such definite clinical characters as a substantive disease that the fact of its being but a local manifestation of a variety of pathological conditions, that is, produced by a variety of different causes, is constantly forgotten. It would be as irrational to treat all kinds of sore throat—scarlatinal, rheumatic, gouty, syphilitic, malignant, diphtheritic—on one principle as to follow routine in dealing with pleurisy.

A considerable proportion of cases of pleurisy, dry and serous, are tuberculous. This fact must at once arrest the attention of the practitioner. His patient is the subject of a disease of the chest that will invade the lungs, either now or at any time or at different times in the future. Pleurisy, hæmoptysis, local tuberculosis in regular or irregular and repeated succession constitute the main features of the natural history of pulmonary tuberculosis in many instances, as discussed under the head of Phthisis. When it is of this kind, pleurisy is to be regarded as a danger signal, and treatment for tuberculosis instituted without delay. In a manner equally unsuspected pleurisy is often rheumatic. With arthritis and endocarditis this diagnosis is easily made, and correct treatment is employed; but when it occurs by itself, as it not infrequently does in children, it is apt to receive no attention from the ætiological side. Salicylates and the other means employed in rheumatism are obviously as clearly indicated in the one instance as in the other. Occasionally the cause has to be attacked not medically but surgically; for instance in pleurisy secondary to infection through the diaphragm from hepatic or perigastric abscess. But it is unnecessary to review in detail all the causes of pleurisy—the acute specific fevers, septic processes local or general, new-growths, gout, Bright's disease, injuries and the rest, or to show how they have severally to be met. The general principle of attention to the cause, kind or *nature* of the inflammation has been sufficiently illustrated. It will be obvious to the reader that sometimes specific remedies, at other times general treatment of the most comprehensive description; sometimes restriction of diet, at other times abundant feeding and stimulation; sometimes change of air, at

other times rest and warmth at home, will be indicated: and that treatment must be preceded in every case by a strictly differential diagnosis.

Pathological Indications.—Next to dealing with the destructive factor of the serous inflammation associated with the particular cause at work, we have to follow if we can the recognised indications: to control vascular reaction; to promote repair; to insure the removal of the products; and to prevent, neutralize or undo the effects of the process on the affected and related parts.

The active hyperæmia of acute pleurisy is now more seldom controlled than was previously the practice by means of leeching, cupping and depressing drugs. Poultices of mustard and crushed linseed are commonly applied, but more to relieve pain than in the hope of modifying the circulation within the vessels of the pleura. It is not improbable, however, that warm and moist applications to the chest may even directly as well as reflexly accelerate exudation, and thus lessen tension and local distress. At the same time repair is promoted on general principles by securing rest by methods which will be noticed presently. The removal of the serous products of the inflammation is our principal object of concern in the treatment of pleurisy with effusion from the pathological point of view; and that this should be so—the simple drain of serous fluid in a mechanical way—shows how little real control we exercise over the morbid process itself. Re-absorption occurs spontaneously in a large proportion of cases, the tide ebbing without direct assistance of any kind after it has reached a variable height. We have here the plainest indication to wait for a time and allow nature to work without interference, whilst the condition of the patient as a whole and the ordinary principles of treatment are respected. The immediate guides to the time of interference being mainly clinical, the subject will be discussed under the next head. In some cases blistering or cupping is employed with a view to hasten the spontaneous absorption of the products, particularly where the amount of fluid is small or where the inflammatory exudation takes the form of solid thickening of the pleura.

The effects of the inflammation on the lungs, chest-wall

and related parts, which constitute the pathological characters of the third or absorptive stage of pleurisy, are such as suggest well-arranged exercises for reinflating the collapsed pulmonary tissues, re-expanding the parietes, and thus preventing the unfortunate effects of fibrous repair in producing adhesion and possibly chronic catarrh or even bronchiectasis. These will be undertaken in convalescence and afterwards.

Purulent pleurisy demands incision and drainage without delay.

Clinical Indications.—The clinical phenomena of acute pleurisy are chiefly of value to the therapeutist as far as they are significant of its ætiological and pathological relations. Those which are of greatest interest to us from our present point of view are the physical signs of the inflammatory process in its different stages, and of the extent to which it interferes with the other viscera, particularly the heart and the opposite lung. At the same time we must not forget that acute pleurisy is also characterised by distress, disorder and danger, which demand direct and in some instances prompt relief.

The pain of pleurisy compels automatic rest of the corresponding side of the chest, and even of the corresponding part of the affected side. The method of strapping the chest introduced by Dr. Frederick Roberts is closely modelled on this provision for natural relief, and is often completely successful, repair following.[1] A thoroughly rational method of securing the same effect is to reduce the acute hyperæmia and swelling of the pleura by leeching or poultices, as we have seen in connexion with the pathological indications. Venesection was employed formerly in very urgent cases of pleurisy in strong individuals, and afforded great relief, apparently by controlling the acute pulmonary congestion often associated with pleurisy. The method commonly followed at present is to administer morphine hypodermically if pain be so severe that strapping or poultices fail. Patients ought not to be left for a whole night, as is sometimes done, suffering from the painful dyspnœa of pleurisy, which is very exhausting and may actually imperil the chance of recovery.

[1] F. T. Roberts, "Theory and Practice of Medicine," 1894, 9th edit. p. 550.

The dyspnœa of acute pleurisy is very instructive to the therapeutist. In the first stage it is characterised by spontaneous repression of the depth of the respiratory movements whilst their frequency is moderately increased, with the effect of relieving pain; and it mostly or entirely disappears with general bodily rest. These are patent suggestions that the extent of the respiratory movements is to be diminished and perfect repose secured by confinement to bed in the easiest posture, whatever that may be. Strapping, as we have seen, answers the same purpose. If the pleurisy be complicated with pneumonia or active pulmonary congestion, the dyspnœa and cyanosia may demand a moderate venesection. When the tide of effusion is at its height, dyspnœa has an entirely different significance. It is an evidence of interference with oxygenation by diminution of the respiratory area from pulmonary collapse, dislocation and compression of the heart, and possibly œdema of the other lung. Whilst rest is still indicated, and with equal urgency, in order to afford relief and prevent syncope, the rational method of treatment is paracentesis. This introduces us to the subject of tapping the chest in pleurisy with effusion, and to the indications for interference furnished by the different clinical phenomena.

There are two great clinical guides to the performance of paracentesis: first, lapse of time or *duration of the effusion;* second, *urgency.* First, no considerable effusion should under any circumstances be left for more than three weeks unless signs of ebb have commenced and are progressive. Fourteen days would probably be a wiser limit; and indeed cases have done well which were not permitted to pass the tenth day although there was no urgency and fever was still present. If fluid be allowed to remain indefinitely in the chest, the lung and the chest-wall both become steadily more impaired in function, and the difficulty of spontaneous absorption increases with thickening of the pleura. Only harm can result from leaving it longer. Second, urgency of symptoms demands immediate operation, however long or however short the duration of the case. Urgency is recognised by:—(*a*) Universal dulness of the affected side. This evidence is otherwise described as disappearance of Skodaic resonance at the apex. Some authorities do not wait

for complete collapse of the lung, but operate when the fluid signs reach the level of the second rib in front. (*b*) Signs of pleurisy on the opposite side. (*c*) Development of râles in the opposite lung. (*d*) Signs of bronchitis, or of pneumonia. (*e*) Signs and symptoms of serious embarrassment of the heart, whether by simple dislocation or by associated endo-pericarditis, or by previous valvular disease or adherent pericardium: pallor, faintness, cold extremities, palpitation, great anxiety and failing pulse. (*f*) Signs and symptoms of grave involvement of other organs: sub-diaphragmatic abscess, acute or chronic Bright's disease with severe symptoms, etc. (*g*) Urgent symptoms of intra-thoracic pressure, whatever their cause: persistent dyspnœa even in bed; with cough, frothy serous expectoration, lividity and sweats. (*h*) Signs and symptoms of increase of effusion after previous arrest or decline.[1]

In order to sustain the patient's strength which is severely taxed by the disease, the food, independently of causal indications, should be nutritious, easily digested, and at the same time as "dry" as the patient can take it. After the acute febrile invasion, slops are to be avoided, unless nothing else can be taken, so as to restrain the effusion. Stimulants will be ordered on general principles. Sleep will be promoted by the measures employed to relieve pain and dyspnœa. Elimination calls for special consideration, for it may be regarded as a necessary complement of absorption of the effusion; and stimulation of the bowels, skin and particularly of the kidneys is therefore calculated to start and promote the natural disappearance of the fluid from the chest. With this object in view, and also to control the fever, the treatment usually is commenced with a purgative, and with the prescription of a combination of saline diuretics and diaphoretics, such as potassium citrate and solution of ammonium acetate, to which potassium iodide may presently be added. Digitalis and squill will reinforce these remedies and at the same time prevent failure of the heart. We have already had occasion in the preceding paragraphs to speak of waiting for the ebb of the effusion; but it now appears and it is to be understood that we do not wait idly. We do what we can by these different methods of

[1] Wilson Fox, "Diseases of the Lungs and Pleura," 1891, p. 1059.

stimulating the excreting organs to check the flow of the tide, and promote the disappearance of the fluid without having recourse to surgical means.

INDICATIONS FROM THE COURSE.—Acute pleurisy is of quite uncertain duration, and the obvious indication therefore is to cut it as short as possible. In this respect it is in striking contrast with pneumonia. We usually attempt to do so at once by the various medicinal measures which have been reviewed; but it is doubtful how often these are to be credited with having prevented dry pleurisy from becoming serous, and how often we really check the rise of fluid in the chest. As we have already seen, there is also evidence that paracentesis might be employed too early, the effusion simply reaccumulating and the fever persisting for some days. *Apart from urgency*, therefore, the period of waiting before paracentesis ought to be at least ten days. On the other hand, it must not be permitted to exceed three weeks.

If the fluid return, the same principles of treatment are to be observed as before.

During the course of pleurisy a variety of complications may require treatment, some of the nature of causes or associated conditions, such as rheumatism and tuberculosis; others of the nature of effects, such as cardiac failure and pulmonary œdema. Sudden death, which sometimes occurs, is best prevented by attention to rest and the rules for paracentesis and other necessary steps already formulated.

INDICATIONS FROM CONVALESCENCE.—Many important considerations arise during convalescence from acute pleurisy. Of these, in addition to the restoration of bodily health and strength on the usual principles, two have to be mentioned again in this connexion. The first is re-expansion of the lungs and chest generally by means of exercises and change to a mountain climate. The second involves a far graver question: whether the pleurisy was of tuberculous kind. In this event we may be assured that the disease as a whole is but temporarily quiescent, and will return sooner or later, usually within a very few years, in the form of pulmonary phthisis unless particular care be taken. The immediate termination of pleurisy in recovery very readily blinds us to the remote prospect. The last

principle to be kept before the mind therefore in such a case is: Do not be deceived by the apparently successful issue of the illness; let prophylactic and particularly climatic treatment for pulmonary tuberculosis be commenced at once. What this is will be found discussed in the chapter on Phthisis.

Outline of Practice.

I. Commencement of the Case.—*At first visit.—General Management and Nursing.*—Rest in bed. Room well ventilated. Nurse in severe cases. Patient's posture as may be most comfortable to himself. Garments warm, but light, loose and easily undone. *Diet* (p. 404): two pints of milk, and one pint of broth. Stimulants rarely necessary. *Medicines.*—(1) A smart mercurial purgative (p. 404): ℞ Hydrargyri Subchloridi gr. iv, Sacchari Lactis gr. ii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. iv, Sacchari Lactis gr. ii.] At once; to be followed by a saline aperient in six hours. (2) A saline diaphoretic, diuretic and febrifuge (p. 404): ℞ Spiritus Ætheris Nitrosi ♏xxx, Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ʒss., Aquæ Chloroformi ad ʒi. [U.S.P. ℞ Spiritus Ætheris Nitrosi ♏xxx, Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ʒss, Aquæ Chloroformi ʒii, Aquæ Destillatæ ad ʒi.] Every four hours. (3) If bronchitis be present, add to (2): Vini Ipecacuanhæ ♏viii. (4) If associated with acute rheumatism: ℞ Sodii Salicylatis gr. xx, Aquæ ʒi. Every four hours. (5) If associated with Bright's disease: ℞ Potassii Acetatis gr. xx, Liquoris Ammonii Acetatis ʒss, Tincturæ Limonis B.P. ♏x, Syrupi ♏xxx, Aquæ ad ʒi. Every four hours. (6) If associated with acute pneumonia, see p. 417. *Local Applications*—mainly anodyne (p. 402): Linseed poultices, linseed and mustard poultices: leeches, followed by poultices; strapping the affected side (p. 402). If pain be severe, give Morphine Hydrochloride gr. $\frac{1}{20}$-$\frac{1}{4}$) and Atropine Sulphate gr. $\frac{1}{120}$-$\frac{1}{60}$ hypodermically. If dyspnœa with cyanosis (pulmonary congestion), venesect to 6-10 fl. oz. (p 403).

II. Progress of the Case.—1. *At second and subsequent visits.—General Management.*—As before. *Diet.* Replace the fluids more and more, as constitutional disturbance subsides

and appetite returns, with farinaceous foods, fish, and other light "dry" solids (p. 404). *Medicines.*—Continue diaphoretic and febrifuge mixture for several days; then substitute a more diuretic mixture: (1) ℞ Potassii Iodidi gr. iii, Potassii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏xx, Tincturæ Digitalis ♏viii, Tincturæ Scillæ ♏xx, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Potassii Iodidi gr. iii, Potassii Bicarbonatis gr. xv, Spiritus Ammonii Aromatici ♏xx, Tincturæ Digitalis ♏viii, Extracti Scillæ Fluidi ♏iv, Aquæ Camphoræ ℥iv, Aquæ Destillatæ ad ℥i.] Every four hours. In certain cases continue specifics as in I. 3, 4, 5, 6. Repeat purgative occasionally. Locally, continue poultices or strapping if found sufficient. Otherwise, relieve pain with hypodermic injections as before. *Other measures:* If condition become urgent (p. 403) *at any time*, perform paracentesis with rigidly antiseptic precautions. If fluid found purulent, incise and drain. If no urgency, and the fluid be ebbing, continue treatment: patient may sit up in bed. If signs of effusion persistent but limited, apply flying blisters, or cup.

2. *On fifteenth day*, if fluid stationary or increasing (p. 405) perform paracentesis.

3. *If fluid return*, continue treatment; and, if necessary, repeat paracentesis.

4. *Convalescence* (p. 405).—As usual after acute disease (see p. 164). But (1) protect patient particularly against chill, by clothing and mild climate; (2) provide exercises, and if possible, mountain air; and (3) prevent pulmonary tuberculosis.

CHAPTER XIX.

ACUTE PNEUMONIA.

In acute croupous pneumonia the practitioner is called upon to treat an acute specific fever caused in certain predisposed individuals, under certain determining circumstances, by a variety of micro-organisms. The pathological process is characterised by local manifestations in the lungs; is attended with a series of distressing and dangerous clinical phenomena; runs a definite short course; and with few exceptions terminates in complete resolution of the affected lung if the patient survive the specific illness itself.

There is probably no better instance in the whole range of pathology of the association of the two great conditions of spontaneous recovery which we studied in Part I., namely, first, strict natural limitation of the period of activity and action of the materies morbi; and second, absolutely complete resolution of the gravely affected part independently of treatment. Interference with the process, as far as experience yet goes, does not expedite or shorten it, nor check its local spread, nor hasten local resolution. Interference with it could not possibly make recovery more complete; for whether the lung have been healthy or the seat of chronic disease when attacked, it is left precisely as before when the process terminates. It would appear from these considerations that, for the present at least, the leading indication—the great pathogenetic indication—for the treatment of acute pneumonia is to leave nature to do her good work unmolested, and let the process die a natural death. This conclusion, however, turns out to be hasty and incorrect. A considerable mortality attends acute

pneumonia, referable in part to exhaustion of the bodily forces as a whole or of some of them in particular, especially the heart; in part to the personal factor; and also to different individual incidents in the process, including violence of the invasion and crisis, prominence of toxæmia, failure of respiration from extent and severity of pulmonary invasion, excessive rise of fever, an extreme degree of distress, and many possible complications. Further, the rapid increase in our knowledge of bacteriology and the introduction of specific remedies afford grounds for the hope that we may soon discover a means of combating the efficient causes of pneumonia, and thus of cutting short the process as we do ague and rheumatism. It thus appears finally that there are after all two directions in which we may assist nature here. First, we may attempt experimentally to deal with the specific causes of pneumonia; second, we have abundant and useful occasion to sustain life and relieve distress until the natural course of the disease is run. This is an excellent opportunity of studying the principles of expectant treatment in full development. As a matter of fact, one of the chief problems up to recent times has been to do what is called for without doing too much.

Ætiological Indications.—Although the efficient causes of acute croupous pneumonia are still imperfectly known, the probability that they are bacterial justifies the employment of specific remedies of recognised antiseptic action. The particular drug commonly prescribed to effect this end is quinine in full doses. Antitoxins are also being tried, so far with encouraging results. Another important and at present more promising ætiological indication is to spare and freely support the bodily strength throughout the attack, inasmuch as it is taxed far more by disease due to micro-organisms than by disease due to simple changes of temperature or traumata. The same indication is reinforced by another fact in the causation of pneumonia, namely, that its victims are often weakly debilitated subjects, occasionally alcoholic, who have little power of repair and recuperation, just as the illness proves the low degree of their resistance. The practitioner should never fail to ask himself these two questions, when planning treatment—the nature of the cause, and the constitution of the patient.

Pathological Indications.—As we have seen in the introduction, the facts of the pathology of croupous pneumonia, regarded as a whole and in relation to the average patient, indicate expectant treatment. Indeed the process might be regarded as the result or manifestation of a natural effort to resist, overcome and localize the destructive agent that is at work. In certain severe types of the process, however, and in individual cases for which the practitioner must always be prepared, there are several pathological conditions which can be distinctly benefited by interference. The stage of engorgement suggests that an attempt might be made to reduce the activity of the hyperæmia in the affected area and the collateral fluxion. It is partly on this principle that either heat on the one hand, in the form of poultices, or cold on the other hand, by means of the ice bag or ice poultice, is applied to the chest; that leeching or venesection might be employed; and that a purgative is a useful measure at the commencement. There are still some good authorities who maintain that antimony and aconite are valuable means of reducing the activity of the inflammatory process in the lung. It cannot be said that the question is settled as to the relative values of heat and cold in pneumonia from the strictly pathological point of view, or indeed whether either degree of temperature has any control over the disturbed circulation within the lungs. Their effect in affording relief is another matter. The abstraction of blood is certainly beneficial when lividity, urgent dyspnœa, and great anxiety show that the right side of the heart as well as the pulmonary circulation is gravely oppressed, but as a matter of fact it is now very rarely considered necessary.

Red hepatization introduces us to two fresh indications of prime importance. The first of these is rest: absence of restlessness, relief of cough and dyspnœa, and scrupulous avoidance of setting the patient up in bed for the purposes of feeding, washing, changing linen or physical examination. Whereas the subject of bronchitis is benefited by occasional careful bodily movement and the provocation of cough and expectoration, the subject of pneumonia must be gently turned in bed, with the help of the draw-sheet. The pathological fact that in hepatization of

the lung the branches of the pulmonary artery are occasionally thrombosed confirms the absolute necessity of these precautions.[1] The second end that has to be secured in hepatization is the supply of abundance of oxygen to the respiratory surface that remains free and working under serious stress. We shall return to this point, and the importance of ventilation and oxygen, under the head of dyspnœa presently. It is possible that the emigration of leucocytes into the alveoli, which contributes to grey hepatization is favoured by continuation of poultices or other warm applications to the chest. As far as is known, we possess no certain means of assisting resolution; and it is quite exceptional for any assistance to be required. "Unresolved pneumonia" is in the great majority of cases unresolved pleurisy; and very often empyema.

Like the other great viscera, the heart is found to have undergone granular degeneration in fatal cases of pneumonia. But in addition to this it has, alone of all the unaffected organs, to do a great increase of work during the disease, in association with the febrile process, with increased resistance in the pulmonary circuit, and also with its vicarious action in favour of the impaired respiration. For these reasons the heart demands special and continual support in acute pneumonia; and as a matter of fact, death in this disease is believed to be more frequently due to cardiac failure than to the condition of the lung itself. Perhaps the most important of all the indications afforded by a study of this disease are the insurance of bodily (circulatory) rest, the administration of abundant nourishment and of alcohol as may be required, and the timely employment of powerful cardiac stimulants, such as strychnine, ammonia and digitalis, when the necessity arises or threatens.

Clinical Indications.—Several therapeutical lessons of great importance may be learned from a study of the clinical characters of acute pneumonia. Here once more we are impressed by the importance of interpreting the significance of phenomena—dyspnœa, cough, fever, and nervous and muscular depression—before proceeding to order measures for their relief. Thus the severely toxic nature of the cause or its

[1] Wilson Fox, *op. cit.* p. 285.

products and the failure of constitutional resistance to them in some cases of pneumonia are revealed to the careful clinical observer by the typhoid type of the symptoms, and suggest to him the urgent necessity of maintaining the vital powers by every proper means at his command. The principal symptoms that call for individual attention in acute pneumonia are pain, dyspnœa, cough and expectoration, fever, the pulse, restlessness, insomnia and delirium.

Pain is one of the initial phenomena, and for forty-eight hours may require to be subdued. We have already seen that either warm poultices or ice, leeches or bleeding may afford relief. The first three of these measures can easily be tried; venesection demands more consideration, and is not practised now for the relief of pain unless it be associated with urgent symptoms of extensive pulmonary congestion and oppression of the right heart in young powerful subjects. If the simpler measures fail, morphine is to be given hypodermically; indeed if pain be severe when the patient is first seen, no time should be lost over other measures before doing so, unless bleeding be practised. There is considerable hesitation on the part of some practitioners to give morphine subcutaneously in acute pulmonary congestion, but this proves to be unreasonable. A patient may die of very pain, restlessness, respiratory distress, insomnia and anxiety if they be allowed to continue for twenty-four hours or more; or his strength is so broken that he succumbs from early exhaustion. A small dose of morphine, guarded if necessary with $\frac{1}{30}$ grain of strychnine, speedily induces a sense of relief and comfort, and often secures a few hours of sleep the first night. If lividity and other symptoms suggest danger of asphyxia, bleeding should be first practised.

The character of the dyspnœa in acute pneumonia is highly suggestive of the direction in which relief should be afforded. It does not consist of long-drawn powerful efforts to overcome obstruction of the respiratory passages as in bronchitis, but of very frequent short superficial pantings, automatically calculated to compensate for the loss of respiratory surface caused by the pneumonia and collateral congestion. Help could be afforded to this natural effort in three different ways at least. First, the atmosphere of the room must be thoroughly

but of course most carefully ventilated, a point sometimes forgotten in practice; or it may be enriched with an artificial supply of oxygen, which often proves invaluable, and should be used earlier and more commonly than is the custom at present. Manifestly these measures will be specially indicated in the stage of consolidation. Second, the demand for oxygen might be reduced, and therewith the severity of the dyspnœal movements and sense of distress, by abstraction of blood as already mentioned. This measure is more rationally employed in the first stage. Third, the heart may be enabled to maintain the vicarious function which it undertakes automatically in pneumonia, namely, to compensate for the reduction of the oxygenating surface of lung by acceleration of the flow of blood through it. We have just touched on this subject under the pathological indications and will return to it presently. In addition to these distinct methods of relieving the dyspnœa, every possible care must be exercised to make the respiratory movements effective and to maintain their force. Attention should always be paid to the patient's posture, firm support afforded to his back, and the bed-coverings as well as his garments made far more light and free than one usually finds them, so that the movements of breathing may be uninterrupted. Ammonium carbonate will help to maintain the respiratory mechanism; but the most valuable medicinal means of doing so is strychnine hypodermically, given if necessary three times a day.

Acute pneumonia may run its course favourably without expectoration, and indeed with little cough. This important clinical fact, which corresponds with the pathological fact that the products of the inflammation are removed by absorption and not by discharge, is in striking contrast to the relations of cough and expectoration in bronchitis, where they are indispensable. The indication drawn from them is obvious: cough is not to be encouraged in pneumonia. At the same time the free discharge of blood-stained products in the first stage must relieve congestion, and should not be interfered with deliberately. It is probable that the old antimonial treatment of pneumonia, already mentioned, promoted this end, and with advantage in sthenic subjects. The important conclusion remains that expectorants are not to be ordered as a matter of routine in

pneumonia. The hacking cough which incessantly breaks in upon the panting dyspnœa in the first stage is relieved by the measures prescribed for the latter and for the pain, particularly morphine.

Careful observation has now established the important conclusion that the pyrexia of pneumonia is, speaking broadly, better left alone. The principal fact in support of this is that a larger proportion of patients die with a temperature of 103° than a temperature of 104°. All the usual objections are to be urged against interference with the body heat (see p. 143). It must be observed, however, in this connexion that quinine as a specific is not contra-indicated on this account; and that hyperpyrexia does occasionally develop in pneumonia and demands instant, thorough and continuous attention.[1] Further, what has just been said must not prevent us from employing those ordinary means of refrigeration in every instance which afford so much relief and comfort to the fever-stricken patient, and promote rest and sleep, but which are so often neglected —control of the temperature of the sick-room, lightness of covering, and tepid sponging of the dry burning skin.

This brings us to the difficult subject of sleep. How dare sleep be promoted with the lungs deeply involved, the heart in distress, the urine scanty and possibly albuminous? And yet the leading indications are to reduce the period of conscious suffering, to rest the lungs and heart, as far as may be, and to husband the bodily strength. The plainest and safest rule that can be followed is to afford relief by all the measures we have already reviewed, and trust to the result promoting sleep indirectly: the personal comfort of the patient; attention to the bed and bedroom; refrigeration of the skin by sponging, packing or bathing; the applications to the chest; the control of pain, dyspnœa and cough; and the constant ministrations of the nurse. The patient will often drop off to sleep under the influence of oxygen, and sleep for half an hour. Here, as in other acute specific fevers, we must be thankful if by means of snatches of ten, fifteen or thirty minutes at a time we can accumulate a night's rest (in addition to day sleep) of

[1] Blaikie Smith, "On the Ice-Cradle in Acute Pneumonia," *Brit. Med. Journ.*, London, 1895, vol. i. 1029.

four to six hours. If obstinate insomnia supervene, chloralamid, sulphonal, paraldehyde, bromides or hyoscyamus may be ordered, or morphine given hypodermically, guarded by atropine and strychnine. Some authorities recommend the use of chloral hydrate combined with digitalis.[1]

Delirium is a grave symptom in acute pneumonia, especially when it occurs late in the course of the disease.[2] It is often significant of alcoholism, declared or secret. Assiduous attention, moral control, cold applications to the head, successful feeding and the intelligent use of alcohol (the immediate effect of which must be observed after each dose) may be sufficient. If they fail, chloral hydrate and bromide of potassium or morphine must be prescribed, with all proper precautions. Hyoscine cannot be safely employed in acute pneumonia.

From what has been already said on the necessity of sustaining the heart and respiration, it naturally follows that nourishment is even more urgently demanded in acute pneumonia than in ordinary fevers, which like it are "fed" as part of the expectant system. Beyond this, it must be studiously remembered that pneumonia ends by crisis, which may make a most severe demand on the bodily resources. Employing the pulse as our guide, we order a full allowance of liquid nourishment: the patient is fed at least every two hours day and night, and hourly or even half-hourly feeds may be necessary in critical cases. Stimulants are employed on the usual principles, if required (p. 591); the importance of sustaining the heart and pulse in a severe disease which runs its course in one or two weeks being always kept before the mind, as well as the liability to cardiac failure and nervous prostration. In many instances the supply must be very liberal; and here the precise nature of the cause that is at work and the personal factor have to be studiously respected. During the crisis also, and for a short time afterwards, brandy may have to be administered freely.

The states of the bowels, urine and skin are important clinical guides in the treatment of pneumonia. Elimination

[1] G. W. Balfour, *Brit. Med. Journ.*, London, 1895, vol. ii. 1158.

[2] T. H. Green, Quain's "Dictionary of Medicine," 1895, vol. i. p. 1187. Wilson Fox, *op. cit.* p. 355.

is specially indicated in a disease where so large an amount of exudation is reabsorbed into the system, presumably for immediate excretion. The remarkable changes in the urine also suggest careful attention to the kidneys; the burning dryness of the skin followed by critical and post-critical sweats is equally instructive. It is a universal clinical rule, therefore, to promote the action of these two great channels of elimination, and also of the bowels, and thus to relieve the right side of the heart and the lungs in their work of excretion at the same time. An early purgative and combinations of diaphoretics and diuretics serve to fulfil these indications. In this connexion reference may be conveniently made to the danger of diarrhœa, a grave complication of acute pneumonia. It must be checked immediately by revising the diet after careful examination of the motions, and prescribing chalk or other proper astringent measures.

Indications from the Course.—These have already been sufficiently set forth in the introduction and in the various parts of the preceding discussion. Points that still call for some notice are the invasion, the crisis, the post-critical period, and convalescence. The remarkably definite and very moderate duration of illness essentially influences the general plan of treatment. The sudden and violent invasion of pneumonia demands prompt employment of the measures for pain, dyspnœa, and cough which have been fully discussed. Rigor and vomiting are usually already over when the case is first seen. The patient should not be left until the pain, if severe, has been distinctly controlled, by morphine if simpler measures fail. *Crisis* must always be provided for. The sudden and great fall of temperature, pulse and respiration, and the coldness, lividity, cardiac failure, prostration, which may attend it, often cause anxiety and indeed do occasionally prove fatal. Abundance of external heat, a liberal use of warm alcoholic stimulants and ammonia, and ether and strychnine internally or subcutaneously, are variously required according to the degree of urgency; and the patient must be closely and continuously watched by the nurse. When the crisis has been safely passed, there is a natural disposition to regard danger as at an end. The infrequent dicrotic feeble pulse of the post-critical period and

the knowledge that the affected lung is still hepatized, the pleura probably acutely inflamed, and the heart exhausted, ought to remind us that this view is premature and dangerous. The necessity for rest and feeding must still be faithfully respected; and diarrhœa instantly checked if it make its appearance.

Convalescence is managed on general principles. It is usually rapid and satisfactory; but occasionally it is interrupted by sequelæ, including empyema, which demand their own proper treatment.

Outline of Practice.

I. Commencement of the Case.—*At first visit.—General Management and Nursing.*—Rest in bed. Room large, with free open fireplace; temperature 60°-62° F. Ventilation without draughts. No gas burning (p. 414). Bedclothing light. Posture as selected by the patient for freedom from distress; the back well supported (p. 413). Light loose woollen garments, opening down the back. One or two nurses, day and night. *Diet.*—Two pints of milk and one pint of beef tea or broth daily, in 5 oz. feeds every two hours; or the same thickened with bread crumb or biscuit powder. One or two eggs. Stimulants only if specially indicated (p. 415).—*Local measures.*—Simple cotton wool; poultices, fomentations, ice-bag, ice-poultices (p. 412). If invasion symptoms, particularly pain and anxiety, be severe: ℞ Injectionis Morphinæ Hypodermicæ ♏iv-v. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{5}$-$\frac{1}{4}$, Aquæ Destillatæ ♏v.] At once (p. 412). Or leech freely. If asphyxia threaten, bleed to 6-10 fl. oz. in strong subjects (pp. 410, 413). *Medicines.*—(1) A purgative: ℞ Pilulæ Hydrargyri gr. iii, Pilulæ Colocynthidis et Hyoscyami gr. ii. [U.S.P. ℞ Massæ Hydrargyri gr. iii, Extracti Colocynthidis Compositi gr. i$\frac{1}{2}$, Extracti Hyoscyami gr. $\frac{1}{2}$.] At once; to be followed with a saline purgative in six hours. (2) Mild diaphoretic, diuretic and febrifuge mixtures (p. 416): (*a*) ℞ Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ʒss, Aquæ Chloroformi ad ʒi. [U.S.P. ℞ Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ʒss, Aquæ Chloroformi ʒii, Aquæ Destillatæ ad ʒi.] Every six hours. (*b*) The same with Vini Anti-

monialis ♏v, in strong young subjects. (3) A variety of specific and antipyretic combinations: (*a*) In influenzal pneumonia: ℞ Quininæ Sulphatis gr. v, Acidi Nitrici Diluti ♏x, Tincturæ Aurantii ʒss, Aquæ Chloroformi ad ʒi. [U.S.P. ℞ Quininæ Sulphatis gr. v, Acidi Nitrici Diluti ♏x, Tincturæ Aurantii Amari ʒss, Aquæ Chloroformi ʒiv, Aquæ Destillatæ ad ʒi.] Every six hours. Or, ℞ Quininæ Sulphatis gr. v-x. Every six hours, in milk. (*b*) In rheumatic pneumonia: ℞ Salicini gr. xv, Extracti Glycyrrhizæ Liquidi ♏xxx, Aquæ ad ʒi. [U.S.P. ℞ Salicini gr. xv, Extracti Glycyrrhizæ Fluidi ♏xxx, Aquæ Destillatæ ad ʒi.] Every six hours.

II. Progress of the Case.—(1) *At the second visit and subsequently until the crisis.—General Management, nursing, diet, local measures.*—Practically as before. Perfect bodily rest (p. 410). *Medicines* as before, substituting the acid quinine mixture for the saline after three or four days. *For relief of special kinds of distress and danger.*—For failing heart and pulmonary œdema (p. 411): (*a*) Commence stimulant, as 3 fl. oz. brandy; and increase to 4, 4½, 6, 8 fl. oz. or even more, as indicated, in frequent doses (p. 415). (*b*) ℞ Liquoris Strychninæ Hydrochloridi ♏iii. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏v-x.] Hypodermically every eight or six hours: or add Liquor Strychninæ Hydrochloridi [Strychninæ Hydrochloratis] or Tinctura Nucis Vomicæ to the mixture before administration. (*c*) Oxygen. — For urgent dyspnœa and lividity: inhalations of oxygen as freely as required (p. 413). —For insomnia, restlessness and delirium (see special cautions, p. 414): (*a*) Non-medicinal remedies, including stimulants and oxygen (p. 414); (*b*) A variety of cerebral sedatives: (1) ℞ Chloralamidi gr. 15-25. (2) ℞ Sulphonalis gr. xx. (3) ℞ Paraldehydi ♏lx-xc, Misturæ Amygdalæ ad ʒi. [U.S.P. ℞ Paraldehydi ♏lx-xc, Emulsionis Amygdalæ ad ʒi.] (4) ℞ Chloral Hydratis gr. xx, Tincturæ Digitalis ♏x, Aquæ ad ʒii. (5) ℞ Injectionis Morphinæ Hypodermicæ ♏iv, Liquoris Atropinæ Sulphatis ♏i, Liquoris Strychninæ Hydrochloridi ♏iii; [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{5}$, Atropinæ Sulphatis gr. $\frac{1}{110}$, Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏x.] Hypodermically. — For diarrhœa: ℞ Pulveris Cretæ Aromatici gr. xxx, Tincturæ Catechu ʒi, Aquæ Chloroformi ad

℥i. [U.S.P. ℞ Pulveris Cinnamomi gr. iiss, Pulveris Myristicæ gr. ii, Pulveris Caryophylli gr. i, Pulveris Cardamomi Seminis gr. i, Sacchari gr. xx, Cretæ Præparatæ gr. vii, Tincturæ Catechu Compositæ ℥ii, Aquæ Chloroformi ℥ss, Aquæ Destillatæ ad ℥i.] After every loose motion. If diarrhœa persist, add Tincturæ Opii ♏xv to the mixture; or: ℞ Tincturæ Opii ♏xx, Mucilaginis Amyli ℥ii. Given as enema.—For high fever (over 104° F.): Tepid sponging, cold sponging, ice-cradle, and other refrigerant measures.—For hyperpyrexia: refrigeration by means of baths or ice.

(2) *At the Crisis* (p. 416).—*General Management.*—Nurse not to leave bedside when crisis is expected. Abundant external warmth with bed-clothes and hot bottles. Alcoholic stimulants: 1 fl. oz. brandy in 4 fl. oz. of hot water. Hypodermic injections of Solution of Strychnine Hydrochloride, as before, if circulatory failure be alarming.

(3) *In the post-critical Stage.—General Management and Nursing.*—As before (necessity for extreme care, p. 416). *Food.*—Milk and broths may be cautiously thickened with arrowroot or rice; peptonised cereal foods. Weak tea with milk. Reduce alcohol gradually. *Medicines.*—Stop the salines, quinine and cerebral sedatives. A respiratory, cardiac, digestive and general tonic mixture: ℞ Tincturæ Nucis Vomicæ ♏v, Ammonii Carbonatis gr. iv, Spiritus Chloroformi ♏v, Infusi Quassiæ B.P. ad ℥i. Three times a day, five minutes before meals.

(4) *In Convalescence.*—Patient sits up gradually. Change to a mildly bracing climate (see p. 368). *Food.*—Ordinary, attractive, nutritious. A little sound wine with meals. *Medicines.*—An acid tonic mixture: ℞ Extracti Cinchonæ Liquidi ♏v, Acidi Nitrici Diluti ♏viii, Syrupi Aurantii ʒss, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Extracti Cinchonæ Fluidi ♏v, Acidi Nitrici Diluti, ♏viii, Syrupi Aurantii ʒss, Aquæ Chloroformi ʒiv, Aquæ Destillatæ ad ℥i.] Three times a day after meals.

CHAPTER XX.

PULMONARY PHTHISIS.

Pulmonary tuberculosis affords the young practitioner exceptional opportunities of studying the principles of therapeutics of which he should not fail to take advantage. The disease is extremely common, and possesses characters constantly suggesting treatment; at the same time it is of infinite variety, in respect of its severity, form, stage and course; and this very variety and complexity are proved to be more closely bound up with spontaneous attempts at recovery than with any other circumstance or influence. Thus an intelligent observer has presented to him, in every case of the disease, suggestions for treatment which he may study closely with reference to the broad principles of therapeutics, as well as to their bearing on the patient before him.

It may be safely said that our improved knowledge of the tuberculous process proves that the successful treatment of it chiefly depends on intelligent guidance of spontaneous resistance and recovery. The power of immunity as one of the methods of Natural Resistance is demonstrated in a remarkable way; and the importance of taking advantage of this can be favourably contrasted with the want of success which unhappily still attends every attempt to attack the efficient cause directly by means of antiseptics and other specific remedies. We shall also find that pulmonary tuberculosis illustrates very fully and clearly the great principles of treatment based on pathological facts. Repair, limitation, the removal of pathological products, anatomical re-adjustment and hypertrophy will all be found actively at work in association with resistance, and the

truth of the striking paradox will be proved that tuberculosis is the most curable of diseases. At the same time the failure of these limited provisions, and some of the unfortunate effects of them, particularly fibrosis, will be brought home to the mind.

Many therapeutical lessons will also be drawn from the clinical characters of pulmonary tuberculosis. Of these one of the most valuable relates to the mistake which is readily made of sacrificing nutrition for the temporary advantage of relief from distress. We shall see that appetite, digestion, assimilation, and oxygenation, metabolism and excretion, the very foundations of successful resistance and repair through the medium of the blood, may be gravely interfered with by the use of morphine given for cough, restlessness or insomnia. But perhaps the most instructive of all the clinical features of this disease regarded therapeutically are the phases or periods of quiescence which are found to occur in its course. They enable the student to understand the meaning of turning to good account certain opportunities in a chronic disease, by seizing on favourable times and seasons in treatment, particularly to carry out measures of critical importance such as emigration. The advantage of attention to the fundamental indication to act early will prove to be also strikingly demonstrated in the very first phases of the tuberculous process when a passing pleurisy or hæmoptysis apprises the observant practitioner that mischief has insidiously begun.

Lastly, we shall presently find that no disease more clearly demonstrates to the thoughtful student the absurdity of routine treatment.

Ætiological Indications.—The two great ætiological indications for the treatment of phthisis are, first, to deal with the efficient cause, the tubercle bacillus; second, to restore natural resistance to it.

Many attempts have been made and many are still being made to deal with the bacillus by means of specifics—carbolic acid, creosote, guaiacol, hypophosphites, arsenic, benzoates, cantharidin and different tuberculins; some given to reach the lung directly through the respiratory passages, some *viâ* the stomach and blood, some subcutaneously. All that can be said at present in favour of this class of measures is that the

patient is entitled to the possible but unproved good that they may do; and that one or other of them may be given, provided it in no respect disagree with him by deranging digestion, causing fever or the like.

As far as our present knowledge extends, the influence most inimical to tubercle is life in fresh air. On this account we rescue the patient from the atmosphere in which we so often find him, especially in towns—ill-ventilated sitting-rooms, laden with the products of respiration and gas, smoke and dust, and a bedroom occupied continuously the whole night and part of the day without the windows being opened; and we either correct all the errors of hygiene by insuring thorough ventilation night as well as day, or we send him to the country, the coast, the ocean, the mountains, the prairie, the veldt, the desert, or a specially designed and regulated sanatorium. When we analyse the qualities of the air in these different parts, we find that *purity* is common to them all and is therefore the chief element of virtue; that temperature and pressure are not essential to their value; that dryness comes second in importance: and that stillness is valuable by preventing dust and the excessive action of cold and by allaying cough. Besides these elements certain others must be possessed by a climate before it can be employed in the treatment of phthisis, namely, brightness, a small number of rainy days, and a dry soil. These enable the patient to spend practically the whole of his time out-of-doors, and take full advantage of the favourable atmosphere. He should be taught to understand that it is for this he goes abroad: that the advantage to be gained there consists in the means he will be afforded of ventilating his lungs in the open air. He should also be told that he is recommended to leave a cold and damp country not only in order to escape catarrhs, but also and chiefly because at home he would be driven into confined quarters; and that in our winter season the weather in-doors is more to be feared than the weather out-of-doors.

The only other way open to us of dealing directly with the bacillus in the lung is to promote its expulsion. This is effected by cough and expectoration, which are therefore to be intelligently promoted, or at any rate not checked in a routine

fashion. The question of the control of cough in phthisis will be fully discussed later on.

The second great ætiological indication for the treatment of tuberculosis is to restore the normal resistance to it of the lungs in particular and of the tissues as a whole. This is a thoroughly practicable end to work for; it is in accord with the principles of ætiology; and as a matter of fact it is still far more successful than the attempts to directly combat the bacillus. Pure air and climate as a whole, which are our most valuable means for that purpose, undoubtedly also benefit phthisis in part by restoring bodily vigour. The other means of increasing general resistance are an abundant supply of attractive highly nutritious food; scrupulous attention to digestion, intestinal and hepatic action, and elimination; judicious clothing; definite regulation of the hours of rest and sleep, and of the amount and kind of exercise; insurance of bodily comfort generally and of mental ease; and lastly, sufficient time. In the course of this part of the treatment, different classes of drugs may be required, including stomachics, laxatives and hæmatinics, tonics, malt and cod liver oil, all being employed with due regard to the more fundamental principles on which the case is being managed. It is also to be remembered that not only general but local resistance has to be restored. Catarrhs and passing local congestions, which are believed to lay open the way for the entrance of the bacilli,[1] must be arrested. Here we see the necessity for a certain degree of mildness of the atmosphere, especially the absence of humidity and movement combined with cold, and the chief cause of the inferiority of the best health-resorts in this country to the Riviera, Egypt and the Alps. The size and shape of the chest which are so often faulty in the tuberculous subject,[2] no doubt to the advantage of the invading bacilli, are calculated to be improved by the means employed for invigorating the patient generally. Residence at high altitudes decidedly increases the girth of the chest

[1] Rindfleisch, "Chronische und acute Tuberkulose," "Ziemssen's Handbuch der spec. Pathol. u. Therapie," 1874, Bd. v. Heft ii. S. 168. T. Henry Green, "Pathology of Pulmonary Consumption," 1878, p. 83.

[2] Jenner in Quain's "Dictionary of Medicine," 1895, vol. i. p. 310, col. ii.

Pathological Indications.—The destructive factor of the tuberculous process in the lung is calculated to be more surely controlled by the hygienic influences which we have found to be inimical to the bacilli and favourable to resistance, than by any other means at present at our command. A free supply of fresh air (in the comprehensive sense of the term), an abundance of nutritious food, arrest of catarrhs and congestions with the aid of simple medicines, such as iodine paint and other counter-irritants, and of occasional short courses of mild expectorants and potassium iodide, bodily and mental comfort, and healthy well-regulated rest and exercise, have the simultaneous effect of interrupting the processes of subacute consolidation, caseation, softening, suppuration and ulceration, which constitute the prominent pathological features of phthisis from the destructive side but are by no means hopelessly progressive. The great frequency with which arrested tuberculosis is found *post mortem*, after all kinds of disease, and the very limited size and distribution of these foci and of many of the lesions in cases of recognised phthisis, are pathological facts in entire accord with this statement. Here, therefore, we find a third indication in phthisis for what is commonly called attention to the general health. Experience certainly proves the correctness of this line of treatment; particularly as contrasted with the "sedative" method which is founded on hopelessness, and consists mainly in relieving distress by opium at the expense of the appetite, the activity of the stomach, bowels and liver, and the natural disposition to exercise in the open air. It is also probable that the benefits which attend treatment (internal or by inhalation) with antiseptics or disinfectants in some instances are due to the action of these on the inflamed and ulcerous surfaces rather than on the bacilli themselves. The late Dr. C. J. B. Williams held that cod liver oil exerts a specific influence in healing ulcers.[1]

An indication which must be faithfully carried into effect in phthisis, as in every other disease attended with suppuration, is removal of the products. Cough and expectoration must be encouraged, as we have already seen; but at the same

[1] Williams, "Pulmonary Consumption," second ed., 1887, p. 386.

time duly controlled. This subject will be fully discussed presently when we come to study the clinical indications.

Another manifestation of the destructive factor of phthisis has to be kept before the mind of the practitioner and to be prevented as far as it can be, or treated if it do occur, namely, hæmorrhage. This will receive separate discussion (see p. 438).

Along with the destructive effects and incidents in phthisis there happily go in most instances certain regenerative processes which promote arrest and frequently establish recovery. The most important of these is connective-tissue growth or fibrosis. The alveolar walls, the peribronchial and perivascular tissues, the interlobular and interlobar and sub-pleural structures all take on special activity and produce a fibroid material. This arrests the destructive wave as it travels outwards, sheaths the vessels in a protective coat, thickens and strengthens the pleura, closes the pleural cavity against perforation, and after a time shrinks inwards upon vomicæ and may successfully crush them up and close them. These effects of fibrosis are purely reparative: they form part of the process of healing such parts as are already damaged and of preventing further lesion. But fibrosis has a conservative effect besides this. It is the means of encapsulating the foci or niduses of the tubercle bacilli, thus isolating and barricading them within the parts already invaded, and leaving them there to "stew in their own juice," to perish perhaps of their own products like the overcrowded population of an invested town. Possibly the last part of this picture is unfaithful to life, for unhappily there is abundant evidence that foci of encapsulated tubercle may become a source of fresh outbreak of the disease if a local accident or failure of resistance in the fibroid capsule afford them an opportunity of release and of proving that their vitality has only been dormant.

Unfortunately there is also a limit to the beneficial effects of fibrosis in the way of repair.[1] It may become excessive or immoderate in its activity and spread. The connective tissue, which is at the best a degenerative substitute for the pulmonary tissue lost, proceeds to contract upon what is left; to curtail the respiratory area; to bind the lung hopelessly to the parietes; and to damage the elasticity of all the structures by which

[1] Douglas Powell, "Diseases of the Lungs and Pleuræ," 1893, p. 368.

respiration and useful cough and expectoration are carried on. There is therefore an urgent indication to keep fibrosis in check. It cannot be reasonably maintained that we possess the means of doing this; but it may be suggested that assiduous attention to the prevention or removal of bronchial and pulmonary catarrhs and congestions, the free use of counter-irritants directed to passing pleurisies, and potassium iodide internally, are at least calculated to control the processes which lead to fibrosis. Well-ordered respiratory gymnastics will undo some of the effects of adhesions on the lungs and chest.

Along with fibrosis there may also occur absorption of part of the constituents of the cheesy material, and so-called "conversion" of the diseased areas into a calcified or calcareous mass.

When all is told, it has to be confessed that treatment, as distinguished from natural recovery, plays but a small part in the direct arrest of pulmonary phthisis. At the same time it is clear that the processes of natural recovery are such as may be aided and guided with advantage, and that many of the elements of them are in our hands: abundant nourishment and healthy digestion; perfect ventilation of the lungs and the blood; sufficient elimination by the different channels of excretion; relief from harassing occupation of mind and body; graduated exercise, according to the activity of the tuberculous process; promotion of free discharge from the affected parts; and control of the occasional and local congestions of the bronchi, alveoli and pleura which favour the spread of the bacilli and exaggerate the fibrosis by which the repair of the lungs and the closure of cavities is being effected.

Others of the pathological characters of phthisis are full of suggestions for the management of the disease in detail. The extraordinary variety in the extent of lung affected teaches us that whilst in many instances treatment is hopeless beyond affording relief, in other instances the lesion is so small that the respiratory functions and useful life as a whole might be successfully carried on, provided a fresh outbreak of the disease were prevented. The size of the lesion will manifestly determine in great measure the question of foreign residence, particularly emigration. Involvement of both lungs, even to a slight or moderate extent is obviously a much graver condition

than disease of equal area entirely confined to one, and indicates caution in recommending a critical step like emigration. The condition of the non-tuberculous portions of the lungs is also an essential factor in determining treatment in individual cases, inasmuch as a man's life depends not only on the extent but on the condition of the lung spared to him, as regards its respiratory value, the probability of improvement or of deterioration of it, and its liability to also become tuberculous. Pathologically we find that the "unaffected" portions of lung may be emphysematous, adherent, fibrosed, catarrhal, in great variety; and we must be prepared to meet with these conditions clinically and to estimate their present and prospective influence on the case. The situation of the principal lesion sometimes has considerable influence on the treatment. In particular, basic cavities by their dependent position, the foulness of their contents and the evidences of persistence and extension, suggest the necessity for special methods of evacuation and disinfection. Lastly, the pathological condition of the other viscera than the lungs impresses upon us the necessity of taking into account the parts beyond the chest when we are settling the grave questions of treatment. We often find, for example, manifestations of tuberculosis, active more often than quiescent, in the larynx and intestine; less often tuberculosis of glands, the genito-urinary tract, joints, bones, etc.; amyloid and other changes in the kidneys, liver and spleen and bowels; as well as casual lesions such as valvular disease, syphilis and gout. Not one of these pathological facts can be safely disregarded when the subject of treatment is raised in a practical form.

Clinical Indications.—The symptoms and signs of phthisis furnish us with a remarkable number of indications of every variety and of every degree of urgency. Some of them, such as cough and wasting, appeal directly for relief, and in practice are too often treated in a routine fashion, as if they were of no other therapeutic significance. But even the most urgent of these, as well as the rest, and the physical signs of endless variety met with in the disease, have to be interpreted into pathological terms if treatment is to be rational and not merely symptomatic. The practitioner always regards the physical

signs as phenomena of pathological states, which he ought to and does determine if possible before ordering even palliative treatment; he is apt to forget that the symptoms are of equal significance and value if their exact characters be faithfully studied. We shall endeavour to keep these considerations before us in discussing the most important symptoms of phthisis.

Cough has a multitude of different relations in phthisis, and presents a variety of indications for treatment, according to the particular pathological state in which it immediately originates, the stage of the disease, the incident that provokes it, the materials to be evacuated as sputa, the state of the stomach and throat, the nervous disposition of the patient, the time of the day or night, and other circumstances.

When cough is a distressing dry hack caused by congestion, tuberculous growth or pleurisy, it is to be regarded as harmful instead of being useful in its effects, and is to be checked. The indication is for remedies directed to these pathological changes respectively, including rest, warmth, medicated inhalations and bronchial and pulmonary sedatives of a simple kind, such as spirit of chloroform, aromatic oils and balsams, and external applications whether directly soothing or counter-irritant. Far more commonly cough is to be practically regarded as a natural provision for effecting the discharge of muco-purulent and other products; and this end is to be promoted by liquefying the sputa by the administration of salines, ipecacuanha, potassium iodide, etc.; by increasing the vigour of the respiratory muscles with ammonia and strychnine; and if need be, by even provoking the cough, as in foul basic cavities by means of inversion and the like. Cough of this kind, ending in expectoration, occurs when the patient awakes from the night's sleep with accumulation in the passages and vomicæ; and we have here a plain indication for a simple expectorant in the form of an early or first breakfast of tea and milk, hot milk, or milk and spirit, according to the kind of night that has been passed and the call for refreshment, nourishment and stimulation. Morphine is obviously not indicated; and indeed if it were given at this hour, contrary to reason, it would make the patient sleep into the forenoon inhaling the polluted atmosphere of his bedroom, sweat heavily, and wake spiritless and indisposed to eat and

take the air. Cough with and for expectoration must also occur at intervals during the day, shorter or longer according to the severity of the case as a whole, but particularly after meals; and it must then be promoted by similar means, morphine again being strictly forbidden. During the night the periodic fits of cough, which rouse the patient and end in expectoration of muco-purulent accumulations, indicate warm, demulcent nourishing liquids, such as milk or beef-tea, with a little brandy if there be much exhaustion; and if the cough persist in a needless harassing way after clearance has been effected, morphine in some form is to be taken. It need hardly be added that in very severe and advanced cases of phthisis, the rules for euthanasia apply to the management of cough, by day as well as by night. In a very large number of instances, however, cough is an unnecessary accident of phthisis, excited by some cause well within our power of prevention or control. We forbid unwise exposure to cold, damp, wind or dust, out-of-doors; and thoughtless, unnecessary exposure to sudden differences of temperature in-doors, in passing from room to room, particularly in retiring from an over-heated sitting-room to a cold bedroom. We caution the patient against exertion, one of the commonest causes of cough, in walking, talking, hurrying upstairs and the like, dyspnœa being the first effect of movement. Simple exhaustion or even fatigue in the evening of a weary day will bring it on, and for this reason and others must not be permitted, the patient being sent early to bed. Cough that is provoked by change of posture must be variously treated. It may seize the patient as he is lying down, particularly on the affected side, so as to interfere with free drainage from a cavity. At bedtime it is aggravated by the chill from cold sheets, assumes a severe hacking character, and persists perhaps for hours until the patient is exhausted. Obviously this ought never to be allowed to occur; but if it do occur a sedative is demanded which will also be a well-timed hypnotic. On the other hand, if cough happen when the patient stirs on waking from sleep in the morning, it is necessary, as we have just seen: evacuation is to be promoted, sedatives are to be strictly avoided. After all, perhaps the most distressing form of cough in phthisis, independently of laryngeal

cough, is that which comes on after food and ends in sickness. This symptom demands enquiry into the state of the stomach (catarrh, atony, dilatation), the pharynx and larynx (catarrh, congestion, ulceration); and it indicates reform in diet, rest after meals, gastric sedatives, various applications to the throat, and counter-irritation over pulmonary cavities.

Whatever may be its remote or its immediately exciting cause, cough, when severe and repeated, tends to become paroxysmal, spasmodic, hacking, incessant or nervous, through irritable weakness of the nervo-muscular mechanism of respiration. Food, stimulants and strychnine are then indicated as well as bodily rest and measures of all kinds calculated to act as nervous sedatives.

The sputa must be disinfected or otherwise safely disposed of.

Dyspnœa in phthisis is due to a variety of causes, several of which have been noticed in connexion with cough, and it calls for different modes of relief accordingly. Wasting suggests generous nourishment in amount, frequency and kind, cod liver oil and malt being peculiarly valuable. Anæmia indicates the use of iron or arsenic in quiescent phthisis. Active tuberculosis is believed to be accelerated by iron.[1] Pain often has to be relieved according to the pathological condition of which it is a symptom. Debility calls for rest and nourishment. The proper periods for rest are of course, first, the night, and secondly, a short time before meals and a considerable time after the principal mid-day meal. The subject of phthisis must retire to bed early for two reasons. First, to escape the impure atmosphere of the sitting-room occupied by the family circle, the products of expiration and transpiration and of blazing gas, the odour of the last meal, and the tobacco smoke; and in addition to these, and equally harmful, the strain of sitting and talking with strong, healthy, hearty friends, who may sympathise with him but cannot practically appreciate his condition of debility. Secondly, to enter the pure atmosphere of his bedroom, which has been thoroughly ventilated all day, and is quiet and of proper temperature. Here he is to spend the night—to him

[1] Trousseau, "Lectures on Clinical Medicine," translated from edition of 1868 (New Syd. Soc.), 1872, vol. v. pp. 96, 97.

possibly the most trying part of the twenty-four hours if cough be urgent. Cessation of cough and moderation of body temperature are evidences of the success of this plan. Morning debility, consequent on a bad night, is best met by prevention ; if the measures recommended fail, the early breakfast and subsequent two hours' rest will serve to restore the strength. The practice of remaining in bed, that is, in the bedroom, far into the forenoon ought to be assiduously discouraged.

The fever of active phthisis is to be relieved by the usual means of refrigeration, such as attention to the temperature of the room, tepid sponging, light but warm clothing and the rest. Abundant experience goes to show that the treatment of phthisis with powerful antipyretic drugs like phenazone and phenacetin is useless or positively debilitating in its effects unless the dose be so small as to produce a moderate fall of temperature. If distress accompany and follow fever from its very height, the best method of relieving it medicinally is to give a dose of only two or three grains of phenacetin every hour for three consecutive hours, say at 5, 6 and 7 P.M. when the temperature is approaching its daily maximum; and to continue these doses daily *if the patient feel relieved by them*—not otherwise.

A number of other symptoms will be referred to presently under the head of *Complications.*

INDICATIONS FROM THE COURSE.—The clinical course of pulmonary tuberculosis presents great varieties. It may be acute as in miliary tuberculosis and in acute pneumonic phthisis. Neither of these forms of the disease is amenable to other than palliative treatment. The prospect is no better in subacute phthisis or galloping consumption, except that the duration is measured by months instead of weeks; the indications here also are purely symptomatic. More commonly the process, whether rapid or slow, is at first definitely limited—say to one apex; the lesion is bounded or confined by a separative zone; and after an illness of variable duration the patient enters on a period of quiescence. If a cavity have formed, as is usually the case, it may become dry; or it may continue to "secrete" or discharge in various

amounts according to the state of the general health, many circumstances, including the weather, and attention to hygiene. In such instances, which constitute the great bulk of cases of phthisis as it comes before us, the arrest usually proves to be but temporary. From some cause or other activity is re-awakened sooner or later. Fresh tuberculous growth occurs, either in and around the old foci, causing extension of the cavities, or in a portion of lung previously unaffected: there is fresh catarrh, caseation, excavation, pleurisy, with a return of the usual symptoms of active phthisis. With care, or spontaneously, this relapse passes off; but it leaves the patient less well, thinner, more anæmic, somewhat cachectic. This experience is commonly repeated at variable intervals, periods of quiescence and activity alternating, until both lungs and the other viscera and the body as a whole are exhausted—after it may be a considerable number of years, during which time any of the numerous complications of phthisis, to be afterwards discussed, have made their appearance.

This is the course of ordinary chronic phthisis; and the course by itself, quite independently of other considerations, is full of suggestions for the treatment of the disease. We find in it, to begin with, clear evidence of the occurrence of recovery—indeed, of repeated recoveries. These are to be regarded as a proof that the patient can recover, and also as a series of opportunities afforded us of stepping in and maintaining at least, if we can do nothing more, the condition of tolerable health to which the patient has been restored. This ought not to be so difficult if the causes or circumstances of the improvement be faithfully regarded. And, more than this, these periods of quiescence ought to teach us that recovery might be assisted or obtained in many more instances by judiciously securing for our patients the same favourable circumstances, and *per contra* by guarding him from recognised causes of recrudescence. It is the hope begotten by observation and study of quiescent phthisis, and the better knowledge of the climatic and nutritive measures which favour it, that give a comparatively hopeful character to the modern view and treatment of early phthisis. We find, secondly, in the course which phthisis commonly pursues, the evidences of the three stages of pulmonary tuberculosis. The first is

the stage of growth; the second is the stage of softening; the third is the cavernous stage with its two phases—the earlier phase whilst excavation is active, the later phase during which the process is arrested and the disease as a whole quiescent, until activity returns, and again and yet again. Each of these will now be briefly considered.

In the *first stage* of pulmonary tuberculosis we find ourselves called upon to treat the earliest manifestations of a disease calculated to run a perfectly uncertain course, but likely to end in death or at least disablement. This is always a time of great anxiety and commonly of distress—of the fear of the interruption and premature termination of a career which as a rule is just opening. The urgent indication here is to arrest the disease whilst it is still of such limited extent or in such a form or phase that the measures indicated by the ætiological and pathological considerations already studied are able to control it. A small apical lesion may often be successfully checked in this way. The patient is taken from work and care, and is placed without delay under the most favourable influences in the way of air, nutrition, regular living, and local and internal remedies. The selection of a climate for him will depend on the many circumstances already considered. In other instances the first evidences of tuberculosis is hæmoptysis or pleurisy, which like a small pulmonary lesion passes off under treatment. Hæmoptysis is usually regarded with concern, yet seldom leads to treatment of a really serious practical kind. Pleurisy is forgotten as a rule when the fever or the effusion has disappeared, and is recollected only with an effort when the patient is hopelessly phthisical some years later. There can be no reasonable doubt but that the occurrence of hæmoptysis or pleurisy under otherwise suspicious circumstances, such as family history, indicates the same treatment as ordinary incipient phthisis, which involves nothing short of a consideration or reconsideration of the whole life of the patient, particularly as to the climate, the work and the conditions generally in which his future is to be spent.

With interruption of work and change of air in the first stage of phthisis there must be raised the questions of wintering abroad, foreign residence, voyages and emigration. It is

now if possible that these important or even serious steps ought to be taken, instead of waiting till cavities have formed and the constitution is impaired. The practitioner is called upon to discharge a duty involving grave responsibility and demanding courage as well as judgment, which can only be founded on an accurate knowledge of all the facts of the particular case, such as we have sketched. It is impossible in a general treatise like the present to lay down rules which should apply to both sexes, all ages, the married and the single, all kinds of occupation, all classes, all temperaments, all varieties of lesion.

When phthisis has entered on its *second stage* it is already too late to send the patient abroad for the present, unless under exceptional circumstances. Speaking broadly, the best place for one with softening tubercle is his own country. Persons of means or with exceptional opportunities should move to good quarters, whether privately or at a recognised sanatorium in the country or on the coast, rarely abroad; whilst the poor may be received into specially constructed and conducted institutions. Rest, comfort, personal attendance, faithful attention to ventilation, feeding, sleep and other means, medicinal and non-medicinal, are to be provided, which we have found to promote the arrest of lung-destruction, the vigour of repair, and the relief of distress.

The *third stage* of phthisis proceeds insensibly from the second; and the first phase of it, excavation, demands precisely similar treatment. By degrees the condition may improve; and now with a promise of early quiescence a more and more invigorating line of treatment will be gradually instituted.

Quiescent phthisis comprises the quiescent phase of cavernous phthisis, tuberculosis arrested in the first stage by changes of the nature of obsolescence and induration, fibroid phthisis independent of true excavation, and other mixed varieties. Most frequently the different evidences of past destruction, repair and arrest are found together, and with them a moderate degree of catarrh of the bronchi and the cavities, adhesion and thickening of the pleura over large areas, changes in the contour and movements of the chest, and some dislocation of the other viscera. It is by careful physical examination that

these conditions are determined to be present; and the symptoms which correspond are definite: absence of fever and sweats; ability for a certain amount of work; body-weight maintained or increasing; cough moderate or only occasional, or confined to the morning; sputa scanty or absent, without pulmonary tissue but still with bacilli, mucous rather than purulent, not sanious. With the advent and establishment of quiescence the practitioner has now, as it were, time to pause and reconsider his position. He finds himself in possession of certain facts of invaluable service to him in planning future treatment. First, the patient has proved that he can recover. Secondly, the form of the reparative process is known—obsolescence, fibrosis, healed cavity. And, thirdly, the circumstances under which this great change has occurred are also within his knowledge. He has now to estimate carefully the damage that has been done and the condition of the "unaffected" parts of the lungs; he reconsiders the many other facts relating to the patient's condition and circumstances which we have analysed; and he may make his plans with deliberation, unless the season and weather compel immediate action. Broadly, the indication which he has to fulfil if possible is to maintain the arrest. This end is most likely to be secured by the full employment of those means of restoring the bodily or constitutional vigour which we have repeatedly mentioned, and to which we need not return here. In particular, now is the time for cod liver oil, regulated by the body-weight, and for tonic medicines and other measures including exercise; and now is the time for once more raising the question of change of air and residence. Persons of limited means, or otherwise tied to home, can take advantage of nothing more than a period of convalescence on the coast or in the country, the part being selected for them. Many tuberculous subjects can avail themselves of the next greater degree of benefit that should be recommended — that of spending a portion or the whole of the winter in a suitable climate at home or abroad, or taking a voyage. It may or may not be desirable to inform patients at once that recovery is not likely to be permanently assured unless a second or even a third winter be passed in the same

way, summer being spent at home; and that whether the result of the first winter abroad be indifferent, or whether it be a complete success, there will be an equally powerful argument in favour of repeating it. In the case of persons of limited means the second winter abroad may be commenced late, provided it be fully completed at the end, that is continued into April or May. The chief advantage of this arrangement is that the favourable influence of the fine weather enjoyed abroad is maintained on the patient's return, instead of being interrupted by a period of harsh easterly winds, such as prevail in England in early spring. *Continuous* treatment under the best conditions is thus insured as far as possible. A certain proportion of those who have enjoyed this method of treatment, whether in the first stage or in the quiescent phase of the third stage of phthisis, regain health and strength permanently—sufficiently at least to enable them to resume work at home under conditions of special care. The same happy result is occasionally obtained in the cases of those who can afford only to pay an occasional visit to the coast. Indeed a certain small proportion of tuberculous subjects recover satisfactorily and remain fairly well without leaving town or giving up work for more than a few weeks at a time. These and others who cannot afford to go abroad ought not to forget, as they often do, that in fine weather their own country presents all the genuine advantages of climate which better-off persons seek elsewhere at so much cost.

Change of residence in quiescent phthisis involves in many instances a far more momentous question than any of the preceding, namely emigration. Before the practitioner undertakes the responsible duty of pronouncing an opinion on the advisability of a step of this magnitude he must ascertain and duly weigh a whole series of important facts that bear upon this problem; as indeed (it may be said in passing) they bear upon every part of the treatment of phthisis in some degree. These facts relate mainly to personal or individual points in the case, and they have to be ascertained therefore in each individual case as it comes before us. These are, amongst others of less moment:—the extent of the lesions; the distribution of the lesions (basic cavities, *e.g.* demanding quite peculiar

treatment); the involvement of one lung or of both (a critical point); the stage of the process — infiltration, softening or excavation, or combinations of these; the amount of fibrosis; the condition of the unaffected, *i.e.* non-tuberculous, portions of lung, on which, after all, not on the lesions, the patient's life depends, according as they are perfectly sound, emphysematous, catarrhal, adherent or otherwise; the state of the larynx, the intestines, and other familiar seats of tuberculosis; the presence or absence of albuminuria and other evidences of nephritis of some form or other; the functional value of the digestive system, which will be severely taxed in treatment; the whole aspect of the patient with respect to strength, bearing, anæmia or cachexia; and the mental condition and disposition. Along with these facts, ascertained by clinical observation, there will have to be determined and considered others which are elicited by enquiry and are mainly historical: the family history; the patient's previous health and diseases, particularly with respect to his power of resistance and of recovery from illness; the duration and progress of the tuberculosis, including the effects of previous treatment and the causes of recrudescence; the presence also of other diseases, such as syphilis; the patient's age, social position and occupation; whether he be single or married, on which single fact may possibly turn the question of emigration; and in married women the relations of pregnancy, parturition and lactation. Here is another almost endless series of facts, each of which has some bearing upon the treatment that is to be recommended. How different is this likely to be from that which is sometimes ordered in response to the formulated question—"What is the treatment of phthisis?"

Indications from Complications.—One of the most striking clinical features of phthisis is the frequency of complications and their variety. Treatment has to be employed for many of them directly—always of course in due subordination to the greater or basal indications of tuberculosis itself. So important also, or even grave, are some of the complications, and so considerable the probability of their occurrence in the course of phthisis, hæmoptysis for instance, that no scheme of treatment involving large issues, such as a voyage, can be

settled without this factor being taken into account and provided for. The complications of phthisis bear different relations to the primary disease. Most of them are associated manifestations of tuberculosis, like pleurisy, meningitis and fistula. Some are of the nature of causes, like diabetes mellitus. A few are accidentally present, for instance gout and syphilis. Most of these and of the other complications call for no further notice in the present connexion. A few will be discussed at more or less length.

Of the treatment of pleurisy in the course of phthisis all that need be said here is that in the removal of serous effusions we should be guided by precisely the same principles as in the non-tuberculous disease. As a rule pleuritic fluid disappears spontaneously after the average number of days. Sufficient reference has already been made to the vital importance of pleurisy, with or without effusion, as one of the earliest signals of tuberculosis, possibly years before the discovery of phthisis. See p. 405.

Hæmoptysis.—Hæmoptysis occurs in pulmonary tuberculosis either at its inception, as a result of hyperæmia: or in its later stages, from vascular or aneurysmal rupture on a larger scale. As in other forms of internal bleeding, the actual value of treatment in hæmoptysis is exceedingly difficult or impossible to estimate. Blood-spitting ceases spontaneously in the great majority of cases, and when it does not we have probably but little power to control it. For all this, it is never to be despised or lightly regarded. If we have but few reliable means of meeting pulmonary hæmorrhage directly, we ought always to do our best to arrest it indirectly, by controlling the circumstances which are known to excite or aggravate it. The primary object of treatment is to *arrest the bleeding*; and the indications in detail are those common to hæmorrhage in all situations, namely, to close the broken and bleeding point; to reduce the blood pressure; and to promote clotting (p. 86). These must be studied in proper order.

Any attempt to close the broken vessel by measures dealing directly with the tuberculous process itself is of course out of the question. We are compelled when face to face with hæmoptysis to attempt to close the vessel on recognised

general principles (see p. 88). We cannot apply pressure locally to a ruptured vessel within the chest. However, we almost certainly derive some help in this direction from the pressure exerted by the coagulated blood upon the broken vessels in a cavity, if it be of small size, and from the pressure of extravasations into the pulmonary tissues in other instances, for intervals of twelve or twenty-four hours' freedom from fresh hæmoptysis often occur, after which clots are brought up. This consideration is one of the many arguments in favour of rest, in other words disturbing the lung and the patient as little as possible. We stand in a somewhat more promising relation to the second indication—to promote active contraction of the affected vessel. Ergot has this action and is extensively employed for it. Silver and lead are rarely if ever given as vascular astringents in hæmoptysis. Alum, however, is occasionally ordered, and appears to be specially useful in passive leakage from ulcerous surfaces, when combined with magnesium sulphate and diluted sulphuric acid. On the same principle also, cold is applied to the surface of the chest in the form of the ice-bag, and given internally. The former method is strongly discountenanced by some of our highest authorities, who deny that local cold possesses the action of constricting the pulmonary vessels, and who maintain that it may do positive harm by inducing bronchitis and pneumonia and even increasing hæmoptysis. Certainly, too, it is often found *post mortem* in cases of fatal hæmoptysis that the ice-bag had not been applied over the particular cavity from which the bleeding proceeded. As to the value of rest in promoting vascular contraction by reducing the blood-flow through the lungs there can be no such difference of opinion. This subject will be considered presently.

Reduction of the blood pressure is the indication which we have most power to fulfil, and which introduces us to the most important means employed in the treatment of hæmoptysis. The cardiac sedatives and depressants include first and chiefly rest—of the body as a whole, of the chest and lungs, and also of the mind inasmuch as alarm and loss of self-control increase the bleeding. Rest is indeed the most important of all measures in the treatment of hæmoptysis:

whatever else we may do must be regarded as secondary in importance to the insurance of rest. The patient is confined to bed; is kept strictly quiet and undisturbed; he is forbidden to speak above a whisper, and is only asked important questions; cough is allayed, and sleep is encouraged. These several important ends are best promoted comprehensively: by means of a hypodermic injection of morphine, given without delay. At the same time the patient is calmed with a few encouraging words; and indeed the simple presence of the practitioner serves to arrest bleeding in some subjects, particularly if his manner be quiet and reassuring. Antimony and ipecacuanha are medicinal cardiac depressants which may be of some service in this direction when given, as they very frequently are in hæmoptysis, to promote easy expectoration. The ice-bag applied to the præcordia rather than over the supposed seat of hæmorrhage from the lung might allay cardiac excitement. Purgation, one of the readiest and surest means of reducing the blood pressure in hæmorrhage, must be used with discrimination. If the bleeding proceed from an area of fresh tuberculisation and active congestion, a brisk purge, calculated to reduce circulatory excitement, cannot well be other than beneficial. If, on the contrary, a considerable branch of the pulmonary artery within a cavity be believed to be the origin of the hæmorrhage, absolute rest for a certain number of hours is imperative, since the movements attending evacuation of the bowels after a purgative might turn the scale against recovery. Food is better withheld altogether for a few hours; thirst as well as cough is relieved with small pieces of ice, given only at considerable intervals lest flatulence and restlessness be produced. This regimen may then be changed for tablespoonful feeds of iced milk or broth; the nurse being instructed that temporary depression, not feeding, is the chief object of treatment. The pulse must of course be carefully watched lest faintness occur. It is only under these circumstances that stimulants in a highly diluted form are permissible. Later on, bread and butter, pudding, and a very little pounded meat may be ordered, the usual free allowance of liquid nourishment being contra-indicated for several days.

Clotting at the bleeding-point, and also within and with-

out it, is promoted by rest of the different parts and functions already referred to, and indirectly by the morphine injection. The value of the drugs employed so extensively as astringents and constringents, in virtue of their action on the blood, is doubtful; and as they derange digestion they are better withheld. Tannic acid is given in a great variety of forms, but is probably useless in pulmonary hæmorrhage, although a powerful local agent, for example in the stomach. Gallic acid is not astringent. Ferric chloride may have some effect. Whether in this way or otherwise, hamamelis does appear to check hæmoptysis. The exhibition of turpentine is sometimes followed by cessation of hæmoptysis which has been severe; and the use of this drug as an inhalation has suggested that it may even act as a local styptic.

The second great object of treatment in hæmoptysis is *removal of the effects*. As pulmonary hæmorrhage declines, a bronchial catarrh frequently makes its appearance for a few days, and the expectoration of small dark clots and stained sputa suggests that the residues of blood are being cleared out from different parts of the lung into which it had been aspirated. By this means the local effects of the hæmorrhage are spontaneously removed, and the danger of inoculation of fresh areas with tubercle bacilli, which find a favourable nidus in blood-residues, is averted. This observation suggests that it would be wise not to interfere with the bronchial flux, and even to reinforce it by means of an expectorant. This is the opportunity for ordering small doses of ipecacuanha or antimony. The constitutional effects of pulmonary hæmorrhage, mainly anæmia and associated debility, must be carefully and cautiously counteracted during and immediately after hæmoptysis without interfering with the other indications; and when it is over they have to be slowly and steadily undone by means of food, fresh air and a little iron, all employed with proper care under the circumstances. When it occurs as one of the earliest events in the clinical history of tuberculosis, hæmoptysis, like pleurisy, ought to indicate immediate and decided measures of a prophylactic character, particularly climatic treatment, instead of the procrastination which is so often practised until the development of gross symptoms and signs of disease of the lungs.

Sweats.—Night-sweats often demand treatment, and this is mainly of a direct kind because of the obscurity that still exists as to their pathological or physiological significance. Three classes of remedy appear to be indicated: first, antipyretics in sufficiently small doses to control the range of temperature without causing of themselves depression and sweating; secondly, respiratory circulatory and nervous stimulants, such as food, alcohol and strychnine; and thirdly, specific antidotes such as atropine and picrotoxin and many others. The attention that is paid to the management of the night in phthisis is calculated to prevent and relieve sweats and the attendant debility.

Derangements of Digestion.—Food.—A great part of the treatment of pulmonary tuberculosis consists as we have seen in restoring nutrition by means of food. The first conditions of successful alimentation are a good appetite and sound digestion. The patient must be encouraged to live generously, partaking as often and as freely as possible of ordinary mixed meals of wholesome, nutritious, attractive and digestible food. Happily one of the interesting features of the disease is the natural maintenance of the gastric functions. A patient suffering from active phthisis will eat with relish at one o'clock a large meal of meat, vegetables, bread and pudding, and digest it comfortably in the course of the next four hours, although his body temperature be 102° rising to 103°. Whatever the explanation of this curious but fortunate preservation of appetite and digestive power may be, they do occasionally break down; but the fact that they might be maintained is the clearest indication of the treatment that ought to be pursued. This proves to be the reverse of the ordinary practice. When anorexia, discomfort, vomiting and the other evidences of indigestion, such as depression, languor, headache, constipation and turbid urine, make their appearance in phthisis, they are too often directly referred to the tuberculosis or to the fever. The patient is ordered milk, essences and every description of patented and advertised foods and "wines"; oil, tonics, malt and the latest specific for tuberculosis are given even more freely than before. The exercise of a little common sense ought to have prevented all this. The

first step to take in such a case is to prescribe a mercurial purge, followed by a saline. The second step is to order a diet of light solids, and specially to supervise the breakfast and supper *menus;* and to cut off stimulants and all manufactured materials excepting a good peptonised cereal food at the evening meal. Thirdly, the times and manner of taking food must be revised. Excessive frequency and excessive amount must be temporarily avoided. If sickness be prominent and persistent, bodily rest is indicated: and the patient should lie down for half an hour before his mid-day meal and for at least two hours after it. Sometimes, indeed, obstinate cough and vomiting have to be met by confining the patient to a couch and bringing him his meals, which he takes in the reclining posture. Counter-irritation is often successful in the distressing cases where feeding provokes paroxysmal cough, ending in vomiting and loss of the entire meal. A flying blister to the epigastrium, applications to the pharynx or larynx, and iodine paint over a large secreting cavity[1] are different measures called for by different conditions. The best internal remedy is a combination of sodium bicarbonate, sal volatile, diluted prussic acid, and diluted infusion of a vegetable bitter stomachic, given shortly before meals to relieve the mucous catarrh of the stomach and promote the appetite and secretion of gastric juice. *Night* feeding in active phthisis is indicated by several considerations: that the night is too long for a patient with advancing tuberculosis to go unfed, patients with pneumonia being fed every two hours; and that broken sleep produces restlessness, increase of cough, sweats and exhaustion.

Much more might be said about the digestive troubles in phthisis, when the stomach is often structurally changed;[2] but reference may be made on this subject to the chapters on diseases of the alimentary tract.

Diarrhœa.—Diarrhœa in phthisis is a symptom of at least three different pathological conditions of the intestine: and rational treatment of it must begin with a careful diagnosis. If there be nothing more serious behind it than catarrh, probably the result of injudicious feeding, the correct treatment

[1] Douglas Powell, *op. cit.* p. 557.

[2] Soltau Fenwick, "Dyspepsia of Phthisis," 1894, pp. 1-14.

consists in rest, warmth, regulation of the diet for two or three days, and castor oil or a few doses of an alkaline rhubarb mixture. But if intestinal tuberculosis be present, and still more if amyloid disease have supervened, the task before us is one of the greatest difficulty or entirely impossible. See Enteric Catarrh—Diarrhœa.

Sleep, which is liable to be broken by cough and expectoration, by the exhaustion and sweating attending fever or a large and steady fall of temperature during the night, and sometimes by pain or other kind of distress, demands a very different amount of attention in different instances. If the causes of distress are successfully met, sleep will follow, excepting on the rare occasions when the difficulty is of the nature of "simple insomnia." A short sleep—of one or two hours according to circumstances—should be deliberately taken after the mid-day meal, especially by patients in the third stage of active phthisis.

Outline of Practice.

I.—First Stage.—*General Management.*—*Rest* from work: not to be unoccupied, but to spend the whole day in purest atmosphere (p. 422); outdoor life. For this purpose secure favourable weather—at home, from home, or abroad. For outline of rules for climatic treatment see p. 450.

Order of the day and night.—6-7 A.M. To remove fatigue and encourage cough and expectoration (p. 428), *First breakfast:* cup of tea and biscuit; or cocoa and bread and butter: or milk, or broth. In weaker subjects, especially after a bad night, milk and 2 to 4 teaspoonfuls of brandy or rum. No sedative. 8 A.M. Rise, tepid bath, dress. 8.30 A.M. till 8.45 A.M. a breath of fresh air. 8.45 A.M. *Breakfast:* eggs, bacon, bread and butter, cold boiled fat ham or bacon, fish, etc.; coffee and milk or cream. 9.30 A.M. till 11 A.M. Out of doors. 11 A.M. *Luncheon:* Glass of hot egg and milk with one tablespoonful of sherry or two teaspoonfuls of brandy, and biscuit: or broth. 11.30 A.M. till 1 P.M. Out-of-doors. 1 P.M. till 1.30 P.M. Toilet and a little rest on bed or couch. 1.30 P.M. till 2.30 P.M. *Dinner:* Fish, mutton (roast, boiled,

chop, cutlet), avoiding fat, chicken with hot bacon or cold fat ham, game, rabbit and bacon, sweetbread, calf's head and bacon. Vegetables: potato, spinach, cauliflower, artichoke, asparagus, seakale, turnip, young cabbage and Brussels sprouts; rice; bread. Claret, one glass; or two teaspoonfuls of brandy in soda water; light bitter ale or stout for young men able to take exercise, with little cough and no dyspepsia. Sweets: puddings—milk and farinaceous of different kinds; suet puddings; stewed fruit, with or without paste, sugar, cream. 2.30 P.M. till 3 or 3.30 or 4 P.M., according to strength and heat of day and weather: rest, and sleep if possible, on bed or on couch. From about 3.30 P.M. till 5 P.M., according to season, weather, etc.: out-of-doors, driving especially; prevent cough by warm coverings, shelter, etc. No sedative. 5 P.M. *Tea:* Tea or light cocoa; bread and butter freely; egg; preserves (if digested). 5.45 P.M. to 7.15 P.M. In summer, out of doors for variable time; in winter, indoors: prevent cough by discouraging talking, smoking, and exhausting efforts to sit up; temperature of room not over 62°. 7.30 P.M. or 8 P.M. *Supper:* soup, fish, or cold chicken or game; a light pudding of any kind; stimulant as at dinner. 9 P.M. *Retire:* Rules for retiring (p. 430). (1) Never sit up after nine o'clock. (2) Retire earlier (however early) if weary. (3) Bedroom (of S., S.W., or W. aspect) large, airy, one-bedded; to be previously prepared by thorough ventilation the whole day. Windows (to be left) open at the top, unless weather be foggy or damp; if so, to be shut and fire lighted for ventilation and required heat (between 58° and 62° F.) with provision for maintaining it all night. Candles; no gas. Bed to be warmed to sufficient temperature to prevent feeling of chill between the sheets and respiratory shock and cough; bed-coverings warm but light; mattress, etc., specially warm; pillows high. (4) Patient mounts stairs slowly lest dyspnœa and cough be provoked; rests for sufficient time in warm easy chair; undresses or is undressed by the fire; a warmed and warm long woollen gown for night clothing. Toilet deliberate. Gets into bed quietly, and rests against high pillows. If cough commence, sleep not to be immediately attempted, but light reading indulged in; or friend or nurse promotes sense of

rest and comfort by quiet monotonous reading of hypnotic literature. If failure to sleep from cough, give sedative: (1) A linctus: ℞ Liquoris Morphinæ Hydrochloridi ♏v, Spiritus Chloroformi ♏ii, Tincturæ Tolutanæ ♏v, Succi Limonis ♏xv, Mucilaginis Acaciæ ad ℥i: [U.S.P. ℞ Morphinæ Hydrochloratis gr. $\frac{1}{2}$, Spiritus Chloroformi ♏ii, Tincturæ Tolutanæ ♏v, Succi Limoni ♏xv, Mucilaginis Acaciæ ad ℥i.] To be slowly sucked from a spoon. (2) A lozenge: (*a*) Trochiscus Morphinæ B.P.: (*b*) Trochiscus Morphinæ et Ipecacuanhæ.—*Rules for night feeding:* If the patient be roused and kept awake by cough, meet the disturbance with warm food: milk, milk and brandy, broth, etc., according to his taste. Vomiting after cough confirms necessity for food. If food and stimulant fail, repeat the morphine linctus. These feeds and even the medicine to be given as often as three times in the course of the night, or as many more times as may be necessary in severe, extensive, actively progressive cases. By 6-7 A.M. the time for the first breakfast has returned.—*Local Treatment.*—Application of iodine paint over area of active disease: ℞ Liquoris Iodi Fortis, Tincturæ Iodi aa. ℥i. [U.S.P. ℞ Iodi gr. l, Potassii Iodidi gr. xxx, Alcohol ℥vi, Aquæ ℥ii, Tincturæ Iodi ℥i.]—*Medicines:* An alkaline and bitter stomachic (pp. 423, 443): Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏v, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day five minutes before meals.—An occasional purgative pill: ℞ Pilulæ Hydrargyri gr. iii, Pilulæ Rhei Compositæ gr. ii. [U.S.P. ℞ Massæ Hydrargyri gr. iii, Pulveris Rhei gr. $\frac{1}{2}$, Aloes Socotrinæ gr. $\frac{1}{3}$, Myrrhæ gr. $\frac{1}{3}$, Saponis gr. $\frac{1}{3}$, Olei Menthæ Piperitæ ♏$\frac{1}{3}$.] One at bedtime.—Cod liver oil, two teaspoonfuls twice a day, after meals.—*Specifics*, if (and as long as) digestion is perfect (p. 421). Either of the following for a definite period of not less than one month, with records of body-weight (every 14 days) and temperature (8 A.M. and 8 P.M. daily): (1) Guaiacol Carbonate gr. 5-10 in *cachet.* Three times a day after meals. (2) ℞ Calcii Hypophosphitis gr. iii, Sodii Hypophosphitis gr. iii, Syrupi Aurantii ℥i, Aquæ ad ℥i. Three times a day after meals.—*For occasional use.*—(*a*) A simple cough linctus: ℞ Vini Ipecacuanhæ ♏v, Spiritus Chloroformi ♏ii, Tincturæ Tolutanæ ♏v, Succi Limonis ♏xv,

Mucilaginis Acaciæ ad ℥i. When required. Or Trochisci as above, with caution. (*b*) An antipyretic (caution, see p. 431): ℞ Phenacetini gr. ii. Every hour from 4 to 6 P.M. inclusive. (*c*) Anhidrotics: (1) ℞ Liquoris Atropinæ Sulphatis ♏ $\frac{1}{2}$, Aquæ ℥i. [U.S.P. ℞ Atropinæ Sulphatis grs. $\frac{1}{220}$, Aquæ Destillatæ ad ℥i.] At bedtime. (2) Extracti Belladonnæ Alcoholici gr. $\frac{1}{4}$, Zinci Oxidi gr. iv; fit pilula. At bedtime.—*All sputa to be disinfected or destroyed.*

For Hæmoptysis (p. 438).—*General Management.*—Complete bodily rest in the most easy posture. If bleeding be free, treat patient where found, avoiding movement and removal of clothes. If bleeding have been very violent, lower the head to allow clearance of trachea, and introduce finger to bring away clots from pharynx. Calm reassuring manner and words (p. 440). Give a powerful and rapid sedative of respiration, circulation, nervous system, and body generally, in form of a hypodermic injection of morphine (gr. $\frac{1}{12}$–gr. $\frac{1}{6}$). No talking permitted. *Room:* Temperature not to exceed 62° F. Candles; no gas. Ventilation secured. Bed-coverings very light. One light woollen or other garment only, others being cut away if necessary. *Food:* Water only at first, to relieve thirst, in sips; or as ice very sparingly. Thereafter small cold fluid "feeds," at short intervals, of milk or broth, or teaspoonfuls of beef essences or jellies. *Stimulants:* none, unless syncope imminent; then in half or one teaspoonful doses in water, with finger on pulse (p. 440). *Medicines.*—A selection of hæmostatics (p. 439): (1) ℞ Extracti Ergotæ Liquidi ♏xxx-℥ii, Glycerini ♏xx, Tincturæ Camphoræ Compositæ ♏xx, Aquæ Cinnamomi ad ℥i. [U.S.P. ℞ Extracti Ergotæ Fluidi ♏xxx-℥ii, Glycerini ♏xx, Tincturæ Opii Camphoratæ ♏xx, Aquæ Cinnamomi ad ℥i.] Every four hours. (2) ℞ Injectionis Ergotini Hypodermicæ ♏v. [U.S.P. Extracti Ergotæ gr. iss, Aquæ Destillatæ ♏x.] To be given by nurse if hæmorrhage return. (3) ℞ Olei Terebinthinæ ♏xlv, Mucilaginis Acaciæ ad ℥i. To be given at once, and one-third of a dose to be repeated every three hours, urination and the urine being watched.

Progress of the Case.—(1) If hæmorrhage persist or return, repeat morphine hypodermically (after proper interval), and

continue the same line of treatment as a whole. (2) If hæmorrhage cease or decline, withhold morphine and continue treatment otherwise, adding a little bread to diet. Consider carefully question of purgation (p. 440). If hæmorrhage persist as a small passive flow, give a vascular astringent and purgative (p. 439): ℞ Aluminis gr. xv, Magnesii Sulphatis gr. xl, Acidi Sulphurici Diluti ♏xv, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Aluminis gr. xv, Magnesii Sulphatis gr. xl, Acidi Sulphurici Diluti ♏xv, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Every four hours.—When the sputum consists of abundant blood-stained mucus (p. 441): ℞ Vini Ipecacuanhæ ♏x, Potassii Iodidi gr. i, Spiritus Ammoniæ Aromatici ♏x, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Vini Ipecacuanhæ ♏x, Potassii Iodidi gr. i, Spiritus Ammoniæ Aromatici ♏x, Aquæ Chloroformi ℥ss, Aquæ Destillatæ ad ℥i.] Every four hours.

II. Second Stage. — *General Management.* — Rest from work. Rest indoors in severe cases. Rest in bed in more severe cases. *Atmosphere.*—Every provision as in I. for abundant pure air. Thorough ventilation of bedroom and sitting-rooms either by special ventilators, open windows, or fires, day and night. Sitting-rooms to be similarly ventilated. As many hours as possible to be passed in garden or other sheltered parts, in reclining posture if strength and weather permit. Not to be sent abroad, temporarily even. Trial may be made of health resorts on South Coast only if the comforts of home can be assured. *Order of the day and night* at least as elaborate and careful as in I. Patient to be encouraged to rise at eight or before: if this impossible, change to a bed in another room desirable. Longer rest probably required before and after dinner. *Latest* hour for retiring, 8 o'clock. General tepid sponging. Night feeding and nursing very strict. Change night-dress once or twice if necessary. For *chills*—hot spirit and water unless rejected. *Medicines.*—A saline mixture (p. 434): ℞ Potassii Citratis gr. xx, Liquoris Ammonii Acetatis ℥ii, Aquæ ad ℥i. Every six hours. If digestion flag, a mercurial pill and stomachics, as in first stage. Cod liver oil and specifics if they can be borne. *For occasional use:* cough linctus or lozenge and

antipyretics and anhidrotics as in first stage. As improvement sets in and advances—an acid tonic mixture, with or without quinine or strychnine: ℞ Acidi Nitrici Diluti ♏viii, Quininæ Sulphatis gr. i, Syrupi Aurantii ♏xxx, Tincturæ Aurantii ♏xx, Aquæ ad ℥i. [U.S.P. ℞ Acidi Nitrici Diluti ♏viii, Quininae Sulphatis gr. i, Syrupi Aurantii ♏xxx, Tincturæ Aurantii Amari ♏xx, Aquæ Destillatæ ad ℥i.] Three times a day after meals. *For cough followed by vomiting* (p. 443)—(1) A gastric sedative and stomachic: ℞ Acidi Hydrocyanici Diluti ♏iii, Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏v, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day five minutes before meals. (2) A gastric sedative powder: ℞ Bismuthi Subnitratis gr. xx. In a little milk or water three times a day three hours after meals, or to be added to each dose of (1). (3) Gargle throat with fresh effervescing soda water. (4) A counter-irritant to stomach: Mitte Emplastrum Cantharidis $1\frac{1}{2} \times 1\frac{1}{2}$ in. To be applied to epigastrium, and the resulting blister dressed.

III. Third Stage.—A. *Active Phase.*—Rest, atmosphere, and general management of day and night as in second stage. Food to be, if possible, even more abundant and nutritious. Question of residence—as in II. *Medicines:* as in second stage. Cod liver oil invaluable. *Inhalations*, continuous, may be tried: ℞ Creosoti, Tincturæ Iodi *Œthereae*, Spiritus Chloroformi, aa. ℥i. A few drops on special inhaler (B. Yeo). *Inhalations* warm and moist: (1) ℞ Tincturæ Benzoini Compositæ ℥i, Aquæ ferventis (180°) O$\frac{1}{2}$. (2) ℞ Chloroformi ♏x, Succi Conii ℥i, Glycerini Acidi Carbolici ♏l, Aquæ bullientis ℥viii.

B. *Quiescent Phase.*—Rest curtailed and exercise gradually increased as quiescence is established. Sitting, walking, driving, sports, etc., as in first stage, and short of dyspnœa and fatigue, in the purest possible atmosphere.—*Climatic treatment* again to be considered, as in first stage. Less difficulty in separating suitable from unsuitable cases, lesions being more pronounced, and the actual and probable complications and disposition either to arrest or to ready relapse and extension being declared by this time (p. 435). After one complete winter abroad, the second

and subsequent winters may be shortened. This best done by postponing departure as long as possible—say till Christmas, so that patient returns, as before, in May, and thus the advantages of good weather are *continuous* (p. 436).—*General Management and Order of the day and night.*—The old day regimen adhered to as far as compatible with light occupation. More variety in the mid-day meal. More substantial evening meal. Less rest or none in afternoon. Hour of retiring extended to 10 o'clock. Night feeding unnecessary. *Medicines.*—Stomachics, purgatives, and tonics continued as in first phase of cavernous stage. Oil to be continued until body-weight is regained; then stopped. Specifics may be given occasionally.

Outline of Rules for Ordering Climatic Treatment.

It is understood that great allowance has to be made for difference in the extent and severity of the disease, and personal and other circumstances of the patient. On the whole the *milder* and more promising the case *the more* reason for foreign climatic treatment if circumstances permit. Importance of prophylaxis in this respect (p. 406 and p. 433). *In each individual patient before ordering climatic treatment consider deliberately the following points:* Age, sex, single or married, occupation, means; extent of lesion; situation of lesion; one lung or both lungs involved; condition of non-tuberculous lung; condition of other viscera—particularly larynx, bowel, kidneys; general vigour; habits; mental disposition (effect of banishment, solitude, etc.); complications actual and probable, especially diabetes, albuminuria, cardiac disease and hæmoptysis. Reconsider also the family history and the previous personal history. When the disease has reached the third stage, note also: general condition of nutrition — anæmia, cachexia, irritability of muscles, elasticity of skin, dropsy; general bearing; ability to rise early, walk and enjoy amusements out-of-doors; ability to work. *Of particular importance:* the course of the present illness: sub-acute or very slow onset; actual duration; progress steady, or repeated periods of quiescence; duration of quiescent intervals; causes of recrudescence; unfavourable circumstances that have *not* interrupted quiescence

(test of resistance); the treatment enjoyed, including previous effects of climates; disposition to dangerous symptoms or complications, such as hæmorrhage or diarrhœa; and complications developed, particularly visceral deterioration, *e.g.* albuminuria.

If the case commence or be discovered in summer (middle of May till middle of October in England): to remain at home if place be favourable till the latter date; otherwise, leave large town, or low, damp, cold dull places, whether enervating or raw, for the country or the coast. Some part of coast always available. Inland country parts more refreshing and reviving than coast in spring and early summer (until heat is severe). Question of winter quarters to be raised and definitely settled by middle of September.—*If the case commence or be discovered in winter* (middle of October till middle of May in England), and the diseased area be small and the symptoms moderate, or if the question of wintering from home be settled affirmatively in cases examined in September: leave home at once for special climatic resort in England or abroad. If area large and symptoms severe remain at home.

CHAPTER XXI.

INDIGESTION—GASTRIC CATARRH.

Indigestion—dyspepsia, difficult digestion—is not a disease, but one of the results of a variety of pathological conditions as well as of simple incompetency or inadequacy of the stomach. It might be defined broadly as the result of disturbance of balance between the food taken and digestive activity. Most frequently blame lies with the food and other ingesta, which are excessive, unreasonable or unfair in quantity, or unsuitable in quality, kind or form. In other instances of dyspepsia it is the stomach that is at fault. Its functional capacity is below normal from some cause or other, temporary or permanent, as we shall presently see, and it is unable to deal with even a moderate amount of perfectly wholesome food. Not uncommonly both ingesta and stomach contribute to the disorder. The result in either case is that the digestive organs have more work thrown upon them than they are able to accomplish. They fail; and either from the time the meal is taken there begins derangement of the chemical decompositions which constitute digestion, or at the end of the usual period the digestive changes in the food remain incomplete. This brief statement introduces us conveniently to many points of therapeutic interest.

Indigestion is either acute or chronic, and it will be more instructive and practically more useful to discuss the two forms separately.

Acute Indigestion—Acute Gastric Catarrh.

These two names are practically synonymous. More strictly they relate to concomitant effects of a common cause, or catarrh may arrest digestion, or the residues of incomplete digestion excite catarrh. The disease as a whole is insignificant, but it is peculiarly interesting to us as illustrating several of the most elementary and important principles of rational therapeutics. Spontaneous removal of the cause is seen promptly and actively at work, and is no doubt very often sufficient and successful by itself; but the need of help and of relief after this violent and depressing method is obvious in many instances. Acute gastric catarrh also furnishes one of the simplest of examples of the origin and nature of inflammation of a mucous membrane; of the rational way in which the treatment of it ought to be conducted after removal of the cause, particularly by means of rest; and of the methods by which rest of the viscera can be secured.

Ætiological Indications.—Dismissing for the present the subject of the prevention of acute gastric catarrh with the recommendation of observance of self-restraint in eating and drinking, particularly by those who recognise but may be tempted to forget the weakness of their digestive organs, we discover that the first ætiological indication for the immediate treatment of the disease when it follows close upon an act of indiscretion in diet is removal of the cause. This can be effected in two ways. The simplest of these is vomiting. Irritation of the fauces with the finger is the most primitive of emetic measures, and one which might be more frequently employed by the practitioner. By far the best emetic in acute dyspepsia is tepid water. The patient is urged to drink one glass after another of water at say 85 degrees, until its nauseating effect on the palate and the very volume of the gastric contents provoke free vomiting. Another draught of water is then taken, with the same effect, bringing up remnants of the offending materials and abundant mucus. To a third draught of tepid water half a teaspoonful of sodium bicarbonate is added, which neutralizes the acid products of decomposition,

dissolves and removes the mucus, whilst the portion of it that is left behind acts as a sedative to the gastric wall and promotes relief and rest. By this simple method an attack of acute indigestion may sometimes be aborted in a few minutes. The other direction in which the cause may be removed is downwards—into or by the bowel. Purgation should always follow an emetic, not replace it. Every particle of the irritant food should be brought back if possible instead of being permitted to traverse and irritate the whole length of the intestine. As a rule, however, the duodenum is already invaded before the practitioner reaches his patient; and whether or no, a surfeit is best followed by thorough evacuation of the bowels and stimulation of the biliary organs. The best purgative is calomel in the form of powder—tasteless, never rejected by the stomach, certain in its action, disinfectant, cholagogue. This should be given when the stomach has been evacuated; and after some four or six hours a Seidlitz powder to follow up its action will be easily retained and will complete the desired effect.

When the cause of acute dyspepsia is nothing more than slight excess of food, or portions of a meal which resist digestion without being actually unwholesome in quality, a less severe measure than direct removal will secure the same end, namely, the use of an artificial digestant. Pepsin in different combinations rapidly effects the digestion of the excess or residue of the ingesta and enables them to pass the pylorus. A purgative is equally indicated here. This method may also be employed when emetics are contra-indicated.

Pathological Indications.—When the stomach is rid of the offending contents, attention must next be turned to the hyperæmia, tumescence and profuse mucous secretion of the interior. The catarrh must be treated on correct principles, of which the promotion of rest, the control of vascular reaction, and the removal of the products are the most important. Rest is enforced in two directions: first, general bodily rest for some hours or possibly more; secondly, more or less complete gastric rest for as long a period as may be necessary. The patient remains in bed and goes without food for a considerable number of hours, the only ingesta being sips of hot water or a little ice to relieve thirst and nausea, and the

necessary medicines. There is rarely any call for nourishment, unless the attack belong to an entirely different class of cases, in which exhausting illness, alone or in association with the ingestion of irritant drugs, such as digitalis, has deranged the stomach. The acute hyperæmia of the surface and the secretion of mucus will be controlled in great measure by attending to the preceding indications; but it is usual to promote the same object by admitting into the stomach free doses of bismuth oxynitrate, sodium bicarbonate, or possibly lime combined with milk. A warm fomentation or poultice on the epigastrium doubtless helps. The products of the catarrh, beyond those which are vomited, are removed *viâ* the bowel.

Clinical Indications.—The distress which attends acute dyspepsia, in the form of nausea, sense of weight and distension, flatulence, actual pain, anxiety and miserable depression, is speedily relieved by attention to the ætiological and pathological indications already discussed. Diluted prussic acid, chloroform, and aromatic carminatives are useful additions to the soda or bismuth mixture. The warm applications to the abdomen also give comfort. When depression is extreme, whether from severity of the attack or delicacy or debility of the patient, alcoholic stimulants are called for, and are best given in effervescence, as champagne or brandy-and-soda. Thirst is relieved by the same means; or more commonly by sips of water as hot as can be taken, or by ice. In some instances a hypodermic injection of morphine sufficiently large to produce sleep is legitimate practice. Nourishment is unnecessary, and therefore food is contra-indicated. Complete abstinence from food for several hours is thus the best rule of diet. When a true sense of gastric craving replaces nausea or indifference, a small quantity of nourishment may be allowed, in the form of milk and soda, bread-and-milk, meat-jelly or thin broths, according to the age, taste and other circumstances of the patient. Koumiss suits some cases well. A return is then gradually made to ordinary fare.

The course of acute gastric catarrh is so short as to suggest that self-denial in the matter of food ought to be cheerfully borne; and this is a further reason for its being recommended.

Outline of Practice.

1. *If the Condition be Urgent.—General Management.*—Rest.—An emetic and gastric antacid (p. 453): A draught of tepid water, repeated until vomiting occurs, assisted if necessary by irritation of the fauces. Repetition of the draught. Second repetition of the draught with the addition of one teaspoonful of sodium bicarbonate. *Diet.*—No food of any kind for 6–12 hours (p. 455). Sips of hot water to relieve thirst; 2 teaspoonfuls of brandy in soda water, or 2 fluid oz. of champagne, if depression be extreme (p. 455). Thereafter, feeds of 2 fluid oz. of milk with ℥xxx of saccharated solution of lime B.P., or of milk and soda water, every hour; followed later by beef tea or clear soup; and later still by boiled fish, etc. *Medicines.*—A non-irritant cholagogue purgative (p. 454): ℞ Hydrargyri Subchloridi gr. iv, Sacchari Lactis gr. iii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. iv, Sacchari Lactis gr. iii.] At once; to be followed in six hours by an effervescing saline purgative.—A gastric sedative (p. 455): ℞ Sodii Bicarbonatis gr. xv, Acidi Hydrocyanici Diluti ℥iii, Spiritus Ammoniæ Aromatici ℥xx, Aquæ ad ℥i. Every four hours, with the addition immediately before administration, of a sedative powder (p. 455): ℞ Bismuthi Subnitratis gr. xx.

2. *If the Condition be less Urgent.*—(P. 454) ℞ Pepsini gr. x. In wafer paper. At once. Or ℞ Glycerini Pepsini B.P. ʒii, Aquæ ad ʒi. At once.—A purgative, as above. *Locally*: a mild mustard poultice to the epigastrium (p. 455).

Chronic Indigestion—Chronic Gastric Catarrh.

The rational treatment of chronic gastric catarrh is a useful exercise in the application of therapeutical principles based on attention to ætiology. At the same time, food and feeding being the principal causes, and these under our control, it offers abundant occasion for the study and practice of the employment of dietetics as a means of treatment. Associated with the catarrh which gives its name to the disease there is present more frequently than it is recognised a degree of

dilatation, and we shall find that these changes furnish us with opportunities for the application of principles founded on a pathological basis. Another therapeutical principle which is always particularly interesting, namely exercise, is illustrated in the routine management of chronic dyspepsia, for it will be presently shown that the disease is more rationally and successfully treated by rousing and assisting the stomach to increased reaction in the presence of difficulties, than by yielding to these and giving it entirely artificial assistance by means of digestive adjuvants.

Ætiological Indications.—The efficient causes of chronic dyspepsia are food, drink and other ingesta; but many different circumstances predispose to disability of the stomach; and a variety of circumstances act as exciting causes, mainly by affording the efficient causes an opportunity of reaching the body. We shall keep these three orders of causes as far as possible separate in the following discussion.

The first ætiological indication is to deal with the efficient causes of chronic indigestion. This is mainly a question of food and feeding, but it also involves the control of medicines recognised as gastric irritants, such as digitalis, iron, arsenic, quinine and many others. Speaking broadly for the present, it may be said that whether to prevent or to remedy dyspepsia we must give the following instructions with respect to food: that it be moderate in quantity, remembering how many dishes are perfectly digestible and may be allowed, provided they be eaten sparingly; that it exclude articles recognised as indigestible, or difficult of digestion, according to degree, but include a sufficient variety of pleasing things, monotony and meddlesome interference with the patient's taste being avoided; and that it be sufficiently masticated and insalivated. When these conditions are fulfilled, it will not be the fault of the food if it and the stomach disagree. Directions with respect to the quantity, the kind and other characters of food and drink constitute a long chapter in dietetics, and will be found set forth, as far as can be done in the present work, in the Outline of Practice at the end of this chapter. Here it is necessary only to insist upon the importance of definite instructions. We are expected to order, perhaps to commit to writing, a series of

menus for the different meals of the dyspeptic; and the young practitioner often feels his knowledge severely taxed in his first efforts in this direction, being well aware that he is giving advice on a subject of which he has very little experience and his patient very much. Directions on what may be called feeding or the taking of food are not called for in every instance. The teeth should always be examined, however; and if enquiry elicits irregularity of meals, indulgence in worrying correspondence, arrangements or other business whilst food is being taken, hurried eating, or other gross errors of the kind, the subject ought to be fully discussed. The patient must be instructed that relish and enjoyment are essential before the complex process of digestion can be successfully commenced; and that unless it be successfully commenced, not one of its subsequent stages will be free from difficulty and distress.

Disability of the stomach comprehends a variety of different conditions, each of which calls for special attention.

The most obvious of these is disease of the stomach itself—chronic catarrh, dilatation, ulcer or cancer. Chronic gastric catarrh is present in many but not in all cases of chronic dyspepsia, the pathogenetic relation of the catarrh and indigestion being complex: failure to complete the digestion of unsuitable food originates catarrh, catarrh further impairs the gastric functions; and a thoroughly vicious circle is established. The bearings of this relation on treatment will be discussed under the pathological indications. Dilatation and ulcer of the stomach are also separately studied. Here, however, it will be well to notice the indications for the treatment of these structural affections of the stomach so far as they interfere with the function of digestion. In all of them we have to respect, temporarily or permanently, the disability of the organ. This we can do practically in two ways. First, we simplify the food, that is, we select foods by nature, preparation or mode of administration more easily digested than ordinary wholesome diet. In the worst cases (cancer and ulcer) the diet may have to consist of frequent small quantities of fluid nourishment, possibly predigested. In dilatation it has to be otherwise quite specially selected (see *Dilatation of the Stomach*, p. 478).

In chronic catarrh we may for a time have to permit only digestible solids, such as boiled white fish and underdone lean mutton, and to forbid many things, such as vegetables, that are quite within the range of wholesome and digestible articles; but steady progress ought to be made in the direction of ordinary food. Secondly, we may order digestive adjuvants, such as pepsin, or peptonised (pancreatised) food. Instead of simplifying the work which the stomach is given to do, we do its work, or a great portion of its work, for it. The result is practically the same—as far as the food is concerned; but, beyond the temporary relief, it is not quite the same on the stomach itself, as we shall presently see. Therefore, whilst it may be necessary to observe this principle in cancer as long as life lasts, we must advance beyond it on other principles in ordinary chronic catarrh, dropping artificial aids and cultivating the natural digestive forces as the mucous membrane is structurally restored.

The stomach is disabled by a very definite set of conditions which disturb the venous circulation in its walls, that is, which produce portal congestion. We meet here with causes of chronic dyspepsia which it is highly desirable but not always possible to remove: functional disorders of the liver, cirrhosis, and chronic cardiac, pulmonary and renal diseases. The pathological relations of the gastric disorder or catarrh and the diseases of the other organs are usually complex, a vicious circle being set up between them; and the stomach therefore calls for direct treatment as well as attention to the cause. This subject will be found discussed under the different diseases named.

When the causes of failure of gastric digestion are traced to affections of the nervous system, an attempt must be made to deal with these causes. We encounter here a common and intractable class of cases. The nervous cause may be central, whether structural disease, worry, anxiety, suspense or grief. Possibly it may be intellectual strain, but excessive application to professional or commercial work is more fruitful as a cause of dyspepsia by interfering with the regularity, duration and condition of meals, by compelling a sedentary life, and by encouraging alcoholism—in a

word, through the medium of the ingesta. All these and allied circumstances which determine indigestion have to be reckoned with and dealt with in different patients, a matter which demands close observation and considerable judgment on the part of the practitioner. In other instances the nervous cause of gastric disorder is reflex: a consideration which opens up to us another large and difficult subject. The stomach is reflexly deranged by morbid conditions of the kidneys, uterus, ovaries, intestines, peritoneum and abdominal structures generally, and indeed, it may be said, of almost every bodily organ. These relations must be differentiated and respected if the attendant dyspepsia is to be remedied.

A complex set of conditions predisposing to chronic indigestion which require to be accurately appreciated and dealt with are found in anæmia, mal-assimilation, disturbances of metabolism, and debility, speaking somewhat broadly. We have in this connexion the indigestion of young women with constipated bowels and disordered menstruation, of bilious and gouty individuals, of sufferers from renal troubles, including gravel, of convalescents and others; although the digestive sufferings of such subjects are not all to be accounted for in this simple way. In these instances the causes of gastric debility and disability might be said to be general, that is, disturbance of the blood and loss of constitutional vigour, and in each of them the particular fault must be remedied as fully as possible. At the same time it is in these cases of debility that we most fully appreciate the application of a principle of treating chronic dyspepsia which is second in importance and success only to dietetic treatment itself. This is the principle of exercising the stomach and thus training it to overtake its work. Stomachic drugs fulfil this indication, if they are well-selected, well-combined, and given at the proper time in relation to meals. A typical stomachic mixture includes a bitter, to rouse the palate and the stomach directly and indirectly; a small dose of alkali, to stimulate the secretion of gastric juice; and an aromatic (best combined with a little spirit) to please the palate, to excite the salivary and mucous glands of the mouth, and to rouse the gastric nerves and muscles to action. It is ordered to be taken a few minutes

before meals, which the patient encounters with the taste and flavour and epigastric sensations produced by it still definitely "about him." The many varieties of stomachic mixtures and gastric tonics universally employed in dyspepsia conform more or less closely to this type, sometimes with the addition of laxatives, which are often required, in the form of senna, aloes or the like. It will be observed that the *rationale* of a stomachic is thoroughly sound physiologically. It evokes the different factors of the digestive process in a moderate degree and at the proper moment, in conditions where they have become languid or weak. It increases relish, the amount of food taken (the kind of food being carefully ordered at the same time), and the amount of material digested; and by these very means it improves the quality of the blood, the bodily vigour (whence stomachics are true tonics) and again the appetite and digestion. After all, there is nothing specific or mysterious in the actions of stomachic medicines. Every well-selected and attractive food is stomachic in its effects, and so is every well-arranged, well-served meal, deliberately taken under pleasing circumstances, it may be in spite of the indigestibility of some of its constituents.

A second complex set of conditions often accountable for chronic dyspepsia, and even more difficult to deal with than the last, can be traced to acknowledged functional incapacity of the stomach, the result of inheritance, idiosyncrasy, age, and other obscure causes. The subjects of this form of indigestion are recognised as confirmed or hopeless dyspeptics. In some of them the nervous influences which control digestion through the glands or the muscles are morbid. In others the gastric structures appear to be imperfectly developed or prematurely atrophied. It is only by exclusion that these cases are diagnosed, that is, by the failure of our attempts at dietetic treatment and of attention to all the other likely causes which we have discussed. Stomachic treatment should always get a fair trial, and will sometimes succeed for a time. Sooner or later, however, we may be compelled to reduce the diet to the simplest form; and then we probably learn that ordinary food, including highly indigestible articles, upsets them very much less than boiled

fish and milk puddings. Acid tonics appear to aid digestion in some of these patients when given shortly after meals, perhaps acting as adjuvants to the gastric juice; in others, when given a quarter of an hour or a little more before meals. We may be driven unwillingly to recommend pepsin preparations to compensate for glandular inefficiency. The end of cases of this type is generally lost sight of, the patients passing on to another authority and to fresh attempts at "cure"!

It is hardly necessary to add, in concluding this lengthened discussion of the management of chronic dyspepsia from the side of its ætiology, that every possible combination of the different kinds of causes, somewhat artificially set forth as they have been, is met with in practice; and that rational treatment varies accordingly.

Pathological Indications.—Chronic indigestion, regarded as a disorder, one of the effects of a variety of diseases which we have already studied under the head of ætiology, may be said to present no pathological indications apart from them. We have, however, to refer briefly to the morbid process so intimately associated with it, namely, chronic gastric catarrh.

Arrest of the destructive factor of the inflammatory process will be mainly effected by attention to its causes, food and drink, the condition of the portal and biliary systems and the bowels, and the many circumstances reviewed in the last section. When micro-organisms play a part in the disease, disinfectants may be given with success, particularly phenol, creosote, sulphites and mercurials. It is possible that bitters act partly in the same way. The circulatory disturbance is controlled by measures which drain and quicken the portal circulation, such as saline and cholagogue purgatives, and by avoidance of alcoholic stimulants and other irritants of the gastric vessels. Catarrh proper is checked by the same means and by the use of alkalis and bismuth. The difficult question of exercise *versus* rest comes up here, just as it does in other forms and situations of chronic inflammation, such as arthritis or endocarditis. Should we give spare and light diet in chronic gastric catarrh lest the stomach be taxed beyond its powers; or should we give a moderate or even free diet and thus

develop its digestive capacity by exercise? The broad rule that is followed in practice may be safely regarded as the best in theory also: to begin the treatment of chronic gastric catarrh with comparative rest, that is with highly digestible food, given in small quantities at short intervals, the measures otherwise indicated being carried out at the same time. As these restore comfort and confidence, we let the stomach be gently called upon for more work by the exhibition of more ordinary meals, at longer intervals, and always preceded by a stomachic such as we have already analysed.

Lastly, in chronic inflammation of the gastric mucous membrane we are called upon to remove the products. In severe and protracted cases of the disease, associated with a degree of dilatation, this indication is summarily fulfilled by means of lavage, which brings away much mucus in addition to undigested remnants and their products. Large doses of alkalis between meals would help to dissolve the mucus and promote its removal into the duodenum. Sodium bicarbonate is a popular remedy in indigestion, and is employed in a great variety of forms. Besides the effect just mentioned, it also fulfils the important object of removing the acid products of the perverted decomposition which occurs in weak digestion. This the soda does by neutralizing the free acids, and perhaps by destroying the medium in which the associated micro-organisms can thrive. Abundant gases are produced in the same disordered process, constituting flatulence; and the stomach may be rid of these along with the acidity by combining a carminative with the alkali, such as peppermint, the aromatic oil probably acting also as an antiseptic. Such an antacid and carminative combination is usually ordered in the form of a powder, to be suspended in water before being taken; but an interesting variety in form, namely the lozenge or tabloid, deserves mention because of its mode of action. Lozenges slowly sucked provoke a flow of saliva, and if this be profuse it neutralizes the excess of acid in the stomach. Indeed this effect appears to occur automatically in acid dyspepsia, which is often characterised by reflex salivation as well as spontaneous eructation. Alkaline lozenges would not act as sialogogues unless mechanically, but the addition of ginger or peppermint, which also makes them

agreeable, and of a little common salt, is sufficient to stimulate the glands of the mouth.[1] It must be carefully observed that this use of alkalis *between* meals, *i.e.* towards the end of gastric digestion, is totally different in principle from the use of them immediately *before* meals, when a very small dose acts as a stimulant to the gastric glands and promotes the acid flow. The acids neutralized between meals are the acids of fermentation, of incomplete or missed digestion, and may call for a liberal dose of soda, which is converted into a neutral salt, passes into the bowel and promotes purgation, doing good only; the acid evoked before meals is the natural hydrochloric acid of the gastric juice, and a large dose of soda at this time would only neutralize its own physiological effect and prove worse than useless.

Clinical Indications.—Many remedies have been employed, especially in a popular way, for the relief of the "symptoms" of indigestion, including flatulence, distress, pain (when it occurs), and acidity, as well as the depression, irritability, languor and clouded condition of brain which so often accompany these. The pathological significance of these phenomena is now fairly understood, and they are to be prevented or removed by attention to the ætiological and pathological indications which we have already described. They need not therefore be further referred to in this place.

It might also appear unnecessary to discuss at this stage of our account of the treatment of the dyspeptic how he is to be fed. The greater part of our advice has concerned his diet. As a matter of fact, however, we have not yet enquired how our patient is to be nourished. The chronic dyspeptic is a starved man, whether judged by the amount of food which he assimilates (which "does him good,") or by his appearance, substance and vigour. Here is an indication for some other characters in his diet than limited quantity and simplicity. Food must nourish as well as agree. This consideration must always be kept before our minds in planning treatment for chronic dyspepsia from the other points of view. Whilst the food conforms with all the other conditions which we have found to be necessary, that is, is wholesome in kind, moderate in

[1] W. Roberts, "Digestion and Diet," 2nd ed., p. 256.

quantity and attractive in form, and whilst the meal is made a deliberate and pleasing function, the nutritive value of the ingesta must be high. This quality alone would be useless unless the other ends were secured, but to secure them this need not be sacrificed.

Of all kinds of food (for the adult) meat is the most nutritious; and in ordering diet for the chronic dyspeptic we must always make an effort to retain meat, or, if this cannot be done, to restore it as early as possible. The most digestible kind of meat in ordinary use is mutton; less ordinary kinds, such as sweetbread, brains, calf's head and tripe, have their proper uses. There are few, if any, ordinary chronic dyspeptics who cannot take, relish and digest properly-selected, well-hung, lean roast mutton, and many cases of the disease in an obstinate form have been successfully treated with it. Every particle of fat, which is of a peculiarly compact, heavy character in the sheep, must be rejected when it is being eaten; and we must be careful to forbid the use of even this otherwise suitable food when cooked a second time. The most tender joints of beef should also be tried; particularly the "under-cut" or fillet of the sirloin. Next to these meats proper, chicken and game are most nutritious, and they are usually easily digested by dyspeptics. Two of the principal meals of the day, luncheon and dinner, are thus satisfactorily provided for, as regards their staple item, and stale bread or toast can always be taken at the same time with relish, safety and advantage. The types of nutritious food at breakfast can also be eaten without risk, namely, lightly boiled eggs, white fish and well-selected bacon. In recommending these articles of diet to the dyspeptic, we desire to convince him that his trouble can be otherwise overcome than by recourse to slops, milk-puddings and other farinaceous dishes, and—which are the worst of all —artificial preparations taken by adult, working, active men and women. These simple, monotonous, uninviting, unsociable dishes are no doubt partly accountable both for the depression and debility of the victims of indigestion, and for the want of success and protracted course which characterise their complaint. As we have already seen, a wholesome, strengthening meat meal is one of the best of stomachics, and a gastric and general tonic.

Stimulants are not indicated as such in chronic indigestion; indeed they are contra-indicated before, between or after meals, alcoholism being a not uncommon cause of gastric disorder, and being itself very easily acquired if stimulants be recommended for depression and weakness, that is to enable the dyspeptic to work. On the other hand, certain alcoholic drinks, of which wine is the type, are often invaluable *as articles of diet* in dyspepsia, and as stimulants of the palate, mouth, stomach and nervous mechanism of digestion generally. A single glass of sound red wine, such as Bordeaux or Burgundy, taken along with the solid parts of the *menu*, whets the appetite, starts the flow of saliva and mucus [1] by which the bolus is thoroughly prepared for transmission to the stomach; stimulates the gastric vessels, nerves, and thus indirectly (and perhaps also directly) the peptic glands, and gives zest to the meal as a whole. Few dyspeptics can indulge in bitter ale for the same purpose. Certain patients may be recommended sparkling wines with advantage, and others are better suited with two or four drachms of brandy in an effervescing water. When stimulants are contra-indicated at meal times, plain water, distilled water made agreeable by aëration, or a sound natural water in bottle, is to be ordered. Milk as a beverage with meals is objectionable.

Exercise is indicated in chronic indigestion, as we have already seen, because it meets one of the commonest of the ætiological indications: it removes the evil influences, which are more than appear on the surface, of sedentary and indolent life, whether in town or country. This statement will be universally accepted, and need not be enforced at greater length. Exercise of itself, immediately and directly, cannot be said to promote gastric digestion, probably the reverse. A short rest after meals, even a brief snatch of sleep, appears to benefit persons with weak digestion, as is typically seen in convalescents.

Outline of Practice.

I. Commencement of Case.—*General Management.*—Work of an ordinary wholesome character. Thorough ventilation of

[1] All wines are acid in reaction.

rooms in indoor occupations (p. 459); regular outdoor exercise (p. 466). *Diet.* — Regularity, deliberation, sociability and cheerfulness essential in connection with meals (p. 458). *Scheme of dietary* in an average case of chronic gastric catarrh: —*Breakfast:* Eggs lightly boiled or poached; or grilled white fish; or thin crisp bacon. Stale bread or toast. Butter unless along with bacon. One small breakfast-cup of tea freshly infused for three minutes only, or coffee with milk, or light natural cocoa; drunk toward the end of the meal. To be avoided: buttered and fried eggs; red and fat fresh fish, and preserved fish of every kind; all preserved meats; sausages; hot rolls, new bread, and buttered toast; all sweets.—*Luncheon:* Slice of roast mutton, or mutton chop, old, well-hung, entirely free from fat; or slice of underdone roast beef; or white fish boiled or fried (excepting the browned portions). A tablespoonful of potato put through sieve or "squeezer." A tablespoonful of spinach, or a few heads of seakale or asparagus. Stale bread or toast. A glass of sparkling water.—*Tea:* One small cup of tea infused not more than three minutes. A dry biscuit or one piece of toast with butter.—*Dinner:* A few tablespoonfuls, only, of clear soup. White fish boiled or fried (the browned portion rejected), eaten with lemon or a tablespoonful of hot stock as sauce. One meat course, selected from: mutton as at luncheon, beef as at luncheon, poultry, game, sweetbread, brains, calf's head. Vegetables as at luncheon. Stale bread or toast. Sweets better avoided; in milder cases: stewed apple and other simple fruits, a few spoonfuls of simple farinaceous pudding or plain custard. Dessert to include a very little sound fruit. *To be avoided at dinner:* Relishes; thick soups; red fleshed, fat and cured fish; crustacea; fish sauces; entrees as such, curries, hashes, pies, stews; lamb, veal, pork; tinned meats of every kind; kidney, liver, heart; duck and goose; mashed potato; uncooked vegetables of every kind; cabbage, broccoli, cauliflower, brussels sprouts, turnip tops, carrots, parsnips; pickles, and prepared sauces; tarts, sweet puddings and pies, suet puddings; cheese (unless ripe and friable and in very small quantities); ices; acid fruits, preserved fruits, nuts; black coffee.—*Beverages at dinner* (p. 466): One or two glasses of sound Bordeaux or Burgundy. A tumbler of pure sparkling

water towards or at the end of the meal.—*At bedtime:* a glass of cold water only; spirits and food of every kind being avoided, however light.

Medicines.—A variety of alkaline and bitter stomachics (p. 460): (1) ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏v, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day five minutes before meals. (2) With a gastric sedative: ℞ Sodii Bicarbonatis gr. xv, Acidi Hydrocyanici Diluti ♏iii, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day five minutes before meals. (3) With a gentle laxative: ℞ Sodii Bicarbonatis gr. x, Tincturæ Sennæ Compositæ ♏xxx, Spiritus Ammoniæ Aromatici ♏xx, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day five minutes before meals. (4) With a general tonic: ℞ Sodii Bicarbonatis gr. xv, Tincturæ Nucis Vomicæ ♏v, Spiritus Ammoniæ Aromatici ♏x, Aquæ ad ℥i. Three times a day five minutes before meals. Or ℞ Ammonii Carbonatis gr. iv, Tincturæ Nucis Vomicæ ♏v, Spiritus Chloroformi ♏v, Infusi Quassiæ ad ℥i. Three times a day five minutes before meals.—*A variety of acid and bitter stomachics* to be given three times a day after meals (p. 462): (1) ℞ Acidi Nitrici Diluti ♏x, Tincturæ Calumbæ ♏xxx, Aquæ ad ℥i. (2) ℞ Acidi Phosphorici Diluti ♏xv, Tincturæ Quassiæ ♏xxx, Syrupi Aurantii ♏xx, Aquæ ad ℥i. (3) ℞ Acidi Nitrici Diluti ♏xv, Tincturæ Lupuli ♏xxx, Infusi Cascarillæ ad ℥i. (4) ℞ Extracti Cinchonæ Liquidi ♏v, Acidi Nitrici Diluti ♏x, Tincturæ Aurantii ♏xxx, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Extracti Cinchonæ Fluidi ♏v, Acidi Nitrici Diluti ♏x, Tincturæ Aurantii Amari ♏xxx, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] (5) ℞ Acidi Hydrochlorici Diluti ♏x, Infusi Gentianæ Compositi ℥i. (6) ℞ Liquoris Strychninæ Hydrochloridi ♏iv, Acidi Nitro-hydrochlorici Diluti ♏x, Tincturæ Aurantii ♏xxx, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{2}\frac{1}{8}$, Acidi Nitro-hydrochlorici Diluti ♏x, Tincturæ Aurantii Amari ♏xxx, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.]—*An occasional purgative* at bedtime (p. 462): (1) ℞ Pilulæ Hydrargyri gr. ii, Pilulæ Rhei Compositæ gr. iii. [U.S.P. ℞ Massæ Hydrargyri gr. ii, Pulveris Rhei gr. i, Aloes Socotrinæ gr. $\frac{1}{2}$, Myrrhæ gr. $\frac{1}{2}$, Saponis, gr. $\frac{1}{2}$, Olei Menthæ

Piperitæ ♏ $\frac{1}{2}$.] (2) ℞ Hydrargyri Subchloridi gr. i, Pilulæ Colocynthidis et Hyoscyami gr. iv. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. i, Extracti Colocynthidis Compositi gr. ii, Extracti Hyoscyami gr. $\frac{1}{2}$.] Either to be followed by an aperient saline in the morning. — *Various gastric antacids* (p. 463): (1) ℞ Sodii Carbonatis Exsiccati gr. iv, Magnesiæ Ponderosæ gr. xx, Bismuthi Subnitratis gr. xx, Ammonii Carbonatis gr. iii, Olei Menthæ Piperitæ ♏ss. In a wineglassful of water three hours after meals, or for flatulence and acidity at any time after meals. (2) ℞ Magnesiæ Ponderosæ gr. v, Sodii Bicarbonatis gr. v, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iv, Rhei Radicis gr. iv, Ipecacuanhæ Radicis gr. ss, Aquæ Menthæ Piperitæ ℥i. Three hours after meals. (3) Antacid lozenges, to be slowly sucked (p. 463)—of Bismuth (B.P.), or of Chalk [U.S.P.], and similar preparations; simple gum jujubes. (4) Mercurial purgatives, as above.—*A variety of digestive adjuvants:* (1) ℞ Pepsini gr. v. In wafer paper immediately after each meal, or sprinkled on meat. (2) ℞ Glycerini Pepsini B.P. ʒi, Aquæ ad ℥i. Immediately after meals.—*A selection of gastric disinfectants* (p. 462): (1) ℞ Acidi Carbolici gr. i, Glycyrrhizæ Radicis gr. i, Altheæ Radicis gr. i. As a pill three hours after the principal meals. (2) ℞ Sodii Sulphitis gr. xv, Syrupi Aurantii Floris ♏xxx, Aquæ ad ℥i. After meals as required. (3) Sodii Sulphocarbolatis gr. x, Tincturæ Aurantii ♏x, Aquæ ℥i. [U.S.P. ℞ Sodii Sulphocarbolatis gr. x, Tincturæ Aurantii Amari ♏x, Aquæ ℥i.] After meals, as required.—*Gastric sedatives* (p. 462): (1) ℞ Bismuthi Subnitratis gr. xx, Pulveris Tragacanthæ Compositi B.P. gr. viii, Spiritus Chloroformi ♏x, Aquæ ad ℥i. Three times a day three hours after meals. (2) ℞ Bismuthi Subnitratis gr. x, Acidi Hydrocyanici Diluti ♏iii, Infusi Gentianæ Compositi, B.P. ad ℥i. Three times a day, shortly before meals.

CHAPTER XXII.

DILATATION OF THE STOMACH.

We turn now from the disturbances of chemical reaction, secretion and delicate nervous mechanisms, to study the relations of therapeutics to a disease which is in great measure purely physical. In the first part of the work the subject of dilatation in general has been already fully discussed, but there are several details which can be treated much more profitably in connexion with an individual organ. The student will now be able to appreciate these, and also to get a clearer view of the great general principles on which dilatation as a whole is rationally treated.

Ætiological, Pathological and Clinical Indications.—The functions of the stomach as an elastic and actively contractile chamber, intended to receive, contain and discharge a variable quantity of materials, render it liable to a disease of a very different character from those which we have just discussed although intimately associated with them in many instances.

Both kinds of dilatation occur in connexion with the stomach —dilatation from over-filling, and dilatation from insufficient emptying. As a matter of fact, the two kinds of dilatation are very often associated, and the one leads to the other; but it is well in a discussion like the present to consider them separately.

Dilatation from Over-filling.—This is the simplest way in which the capacity of the stomach is increased, and it is or ought to be the cause of dilatation most easily prevented or removed in treatment. Acute dilatation of the stomach by

large eating or drinking is not unknown, and even rupture of the stomach is said to have occurred from this cause. But gastro-ectasis is far more commonly a chronic affection. The subjects of chronic gastric catarrh, associated with a degree of dilatation of the stomach from atony of the wall (to be presently described), develop an excessive appetite and eat largely: a vicious circle is established, and the morbid condition aggravates itself automatically. In these cases, and indeed in dilatation of the stomach of every kind, over-eating and over-drinking are to be stopped, in the hope of inducing return of the organ to rather more moderate dimensions. The amount of solid food must be reduced; the amount of fluids reduced; and all effervescent drinks, all flatulent articles of diet, such as most of the green vegetables and fruits and strong tea, and all indigestible materials, which directly or indirectly set free gas in the stomach, strictly forbidden.

Over-filling, that is over-feeding, is probably accountable in part for dilatation of the stomach associated with phthisis and the acute specific fevers; but the condition of the tissues of the gastric walls is naturally one of diminished resistance to internal pressure; and the dilatation, being in part referable to insufficient emptying, falls under the next head.

Dilatation from Insufficient Emptying: Residual Dilatation. The stomach, like the heart and other hollow organs, becomes dilated when its muscular walls fail to empty it sufficiently within the ordinary or normal time, which from the practical point of view means before the arrival of the next meal. The disease originates in two ways which are known respectively as *actual* and *relative* or *virtual* obstruction of the pylorus; and residual dilatation of the stomach is found associated with either or both of these.

Actual pyloric obstruction is an obvious pathological condition, due to growth, to cicatricial stenosis, or to pressure or constriction externally. The lesion resembles aortic or mitral stenosis in its effects: hypertrophy is set up in the gastric as it is in the cardiac wall behind the seat of increased resistance, which it temporarily overcomes, until from some cause or other failure of what might be called the myogastrium occurs. Relative pyloric obstruction is a functional disorder.

The pyloric opening is of normal size and free from disease; but the chyme which presents itself for passage through it at the usual time is not in a fit condition to leave the stomach, and is turned back from the opening, which is thus the seat of virtual, not actual, obstruction. In other words, the pylorus is not unable to admit the chyme, but the chyme is unfit to enter the pylorus. It is obvious that relative obstruction occurs in every instance of delayed digestion, that is, chronic dyspepsia; and that dilatation is likely to result if digestion is not completed before the next meal. More definitely, relative obstruction is a result of hurried eating, of bad teeth, of eating coarse fare ravenously after a long interval, as we see in travellers, explorers, etc., the food entering the stomach in lumps neither sufficiently masticated nor insalivated. Possibly excessive indulgence in tea and coffee, which delay digestion,[1] has a similar effect. It is very probable that relative as well as actual dilatation induces and is accompanied by a degree of hypertrophy of the muscular coat of the stomach.[2] If the hypertrophy be sufficiently developed and maintained, a degree of compensation of the disability is effected. Several circumstances, however, conspire to undo or overcome the muscular hypertrophy which accompanies actual or relative pyloric obstruction, to interfere with sufficient emptying of the stomach, and to favour retention and residual dilatation. Such causes of failure of compensation must be carefully appreciated.

The first of these is increase of structural disease at the pylorus. When it is the seat of new growth or of cicatricial stenosis, the opening gradually becomes narrowed, until in some instances it may barely admit a probe. The neighbouring musculature becomes still more thickened; but in vain. Most of the food is retained for an abnormal length of time in the stomach; residual dilatation advances apace; vomiting ("back-working": "backward pressure") relieves it partially or temporarily only, like the safety-valve action of the

[1] W. Roberts, *op. cit.*, p. 139.

[2] Ewald, "Lectures on Diseases of the Digestive Organs," vol. ii., "The Stomach" (New Syd. Soc.), 1892, p. 328; S. Martin, "Functional and Organic Diseases of the Stomach," 1895, p. 245.

tricuspid valve, but with more immediate success. This is the history of pyloric carcinoma, and often of the stricture which results from corrosive poisoning or gastric ulcer.

A second circumstance which encourages residual dilatation in pyloric disease or disorder is failure of nutrition of the muscular walls of the stomach. This occurs as the result of dyspepsia, inanition, toxæmia, cachexia and the exhaustion attending vomiting. The propulsive wave, so powerful in many instances as to be visible through the abdominal walls, tends to become weak. The most important association of parietal failure, however, is with relative pyloric obstruction and with chronic indigestion in which this originates. In chronic gastric catarrh the muscular coat, being involved along with the mucous, becomes atonic and powerless. The results of attempts of the debilitated organ to force imperfectly digested food through the sentient pylorus are obvious: still more insufficient emptying, further retention of residues, and increased dilatation. We have here a morbid condition of the stomach which is probably far more common than we are accustomed to believe—one that is ordinarily described as chronic or atonic dyspepsia.

The third cause of failure of compensation is gaseous distension of the stomach from decomposition of its contents. Torulæ, sarcinæ, and other micro-organisms are intimately associated with this process, which consists in the conversion of carbohydrate foods into alcohol, acetic, lactic and butyric acids, water and carbonic acid gas. In other instances offensive and even inflammable gases are developed. The unnatural pressure dilates the stomach still more and relieves itself backwards by eructations.

We are now in a position to understand a third mode of origin of dilatation of the stomach. Even with a perfectly normal pylorus and with perfectly suitable food, whether solid or liquid, the nervo-muscular structures of the parietes of the stomach are sometimes so weakened by disease that they fail to empty it before the arrival of the next meal. Residues accumulate and ferment, and simple dilatation is gradually established. This form of the disease is met with in chronic debilitating diseases such as pulmonary phthisis,

and possibly in some cases of the acute specific fevers where patients are systematically overfed, over-filling no doubt contributing to the dilatation set up by insufficient emptying.

The first indication for treatment in dilatation of the stomach from insufficient emptying is to deal with the cause. When this consists in actual pyloric obstruction, the indication is obvious: to dilate the pylorus, to perform pylorectomy or to establish a new opening from the stomach into the bowel. These are purely surgical proceedings. The first can sometimes be accomplished in non-malignant cases: pylorectomy appears to be very dangerous; short-circuiting has frequently been successful, and holds out considerable promise of useful development. If operation cannot be undertaken, all that can be done in this direction is to evade the pylorus, as it were, by feeding per rectum.

Virtual or relative obstruction of the pylorus, if it be regarded intelligently, presents many suggestions for rational treatment. Our primary object must be to reform the diet in respect both of quantity and kind, as well as the manner of eating. These and other means are calculated to remedy chronic gastric catarrh, as was discussed under its proper heading, p. 456. It is particularly important that the teeth be seen to, that the food should not be bolted, and that the stomach should not be over-filled. We have already seen that the patient must be cautioned against yielding to his urgent and morbid appetite, begotten of the unnatural capacity of his stomach, the small proportion of nourishment which is actually absorbed, and evil habit, for gastro-ectasis truly grows by what it feeds on. Spare dry meals might gradually induce return of the organ to its normal size. Strict directions have to be given respecting alcohol, which often will be found to have been taken in excess for the purpose of relieving the sense of exhaustion and lowness, and of promoting digestion by exciting the toneless vessels.

Attention must next be turned to direct means of restoring the muscular vigour of the coats of the stomach, and preserving their elasticity. Strychnine and possibly acid bitter medicines are calculated to have this effect; but in relative obstruction more dependence can be placed on attention to

personal hygiene in the fullest sense, which will be found to have been neglected by many of the subjects of this disease —wholesome bodily exercise and mental relaxation; regular, deliberate and sociable meals; and daily evacuation of the bowels. In this way the debility, heartlessness and digestive incapacity itself are also successfully removed. Manifestly improvement of digestion will react quickly on the nutritive and functional conditions of the gastric walls. The smallest improvement is therefore a decided and promising gain.

In all cases of residual dilatation, as we saw in Part I., there is an indication to remove residues which have accumulated as arrears of work within the cavity. In connexion with all hollow organs subject to dilatation from muscular failure, such as the heart, bladder and bowel, this step is necessary; in the case of the stomach it is peculiarly essential, since retention of imperfectly digested food leads to decomposition, and decomposition to further weakening of the walls and further dilatation by gaseous pressure, as we have just seen. The most obvious method of emptying the stomach is by vomiting. It is the automatic means of relief which usually secures a few days' comfort until arrears have re-accumulated. The sufferer from dilated stomach sometimes practises it for himself in the acme of his distress from distension and pain. Emetics might be employed therapeutically; but a more elegant and thorough and much less depressing means is found in lavage. The stomach-tube is passed, the abundant acid frothy fluid is evacuated, and the more solid particles and mucus are washed out: the indication is successfully fulfilled. In a case of dilatation under regular treatment the practitioner does not wait for residues to form, or at any rate to accumulate, but arranges for daily lavage. Some patients, however, do not require lavage and others will not submit to it. For them two indirect methods of dealing with decomposition of the residues may be employed, in addition to measures otherwise indicated. Torulæ and sarcinæ may be destroyed *in situ* by means of disinfectants, of which sulphites, phenol and creosote are examples; and they are also starved by removing saccharine and amyloid substances from the diet.

In this connexion the next indication will be readily

appreciated: to prevent or remove distension of the stomach by the gaseous products of fermentation. This object also practically resolves itself into the exclusion from the diet more or less completely of carbohydrates in different forms. Obviously it is also assisted by every measure which promotes digestion. This reference introduces us to the principles on which food is to be ordered in gastro-ectasis, and which it will be well to review and summarise. In dilatation of the stomach from actual obstruction at the pylorus, feeding often has to be accomplished *per rectum*—by means of nutrient enemata and suppositories. By the stomach, food should be given fluid; in small quantities at a time, say 5, 3, 2, or 1 fl. oz., according to the tolerance of the stomach and other circumstances; repeated frequently, in due relation to the size of each feed: and highly nutritious. Milk and strong broths, alone or variously combined with raw eggs, fulfil these several conditions. All going well, an attempt should be made to give pre-digested (peptonised, pancreatised) farinaceous and milk food by way of a change. No pains must be spared to give variety to the diet, and prevent the loathing which is developed by monotonous fare. Milk alone can be given in many different forms and with many different flavours; and broths can be made from many different materials. For dilatation of the stomach with relative pyloric obstruction, the diet is the same as that for chronic gastric catarrh, considerably specialised. In planning it we ought to keep several qualifying considerations before the mind. The patient is not "fed," as is the victim of pyloric stenosis, but feeds himself. Most probably he suffers from a sense of sinking, craving or urgent hunger as soon as his stomach is emptied; and is essentially a starved man. Considerable liberty in the selection of food may have to be allowed him, and will certainly be taken, if he be in active employment. The following scheme of diet accordingly is to be regarded as only a theoretical one, involving the strictest regimen which could well be planned, one which must be freely and variously relaxed in different instances as they come before the practitioner, and as the condition of the patient improves.

In order to fulfil the many indications which we have discovered, the food would have to possess the following charac-

ters :—It must be sparing in amount, and therefore relatively nutritious. Over-distension is to be avoided in future, and the stomach encouraged as it were to contract on meals of small bulk, but high nutritive value, such as meat. It ought to include but a very small proportion of liquids. Milk, tea and coffee, and beverages generally should be limited in quantity, and soups and malt liquors interdicted. It must be non-fermentable. This condition would exclude sugar and the many foods, dishes and drinks containing it. Amyloids would be restricted for the same reason; and this is a point of real practical importance, as sufferers from chronic gastric catarrh very often have recourse to bread-and-milk, biscuits, and puddings and other farinaceous dishes in a vain endeavour to eat "light things." The practitioner must use his judgment in each case how far this severe rule is to be observed or relaxed. There are now many excellent breads and biscuits with only a low percentage of starch. Flatulent materials are not admissible—theoretically; green vegetables of the cabbage species, all salads, pastry, meat twice cooked, strong tea, sauces, aërated drinks, and many rich dishes fall under this head. Spirits are interdicted, being a common cause of gastric catarrh, and the temporary relief which they afford drifting the patient into alcoholism. Whatever freedom may be allowed the patient in the matter of food, he must have none in the manner of feeding, that is, his meals must be arranged in a regular and orderly fashion, should be four in number daily, so that temptation to free indulgence of the appetite may not arise, and should be taken comfortably, deliberately and sociably, without preoccupation or worry.

The last indication for the treatment of dilatation of the stomach from obstruction with failure of the walls is to relieve distress and debility and avert danger. When the stomach is over-distended with accumulated residues, severe paroxysms of gastric colic come on, culminating in either automatic or factitious vomiting, which is attended with great distress and exhaustion, but followed by a sense of intense relief and very shortly by a desire for food. We have seen (p. 475) how these attacks are to be relieved, namely by immediate and repeated evacuation of the stomach; and this

step might be followed with a carminative draught consisting of bismuth oxynitrate, sal volatile and various other aromatics. Large doses of bicarbonates as habitual antacids are theoretically contra-indicated, lest the carbonic acid disengaged in the stomach increase the dilatation: alkaline and saline lozenges slowly sucked, lime water and liquor potassæ would be more suitable. Warm applications to the epigastrium hasten the disappearance of distress.

Patients with dilatation of the stomach commonly suffer from constipation, which will call for attention.

Outline of Practice.

Diet: Meals.—1. *In relative pyloric obstruction and in early stage of actual stenosis.*—Arrange for meals of *small bulk* (p. 477). Reform habits of eating (p. 477). Attend to the teeth (p. 474).

Arrangement of meals.—Breakfast: Coffee, natural cocoa, or tea, sparingly, with small quantity (p. 477) of milk sweetened if desired with saccharin, or of specially condensed peptonised milk. "Diabetic" bread or biscuits; or ordinary bread very sparingly. Butter. Eggs, lightly boiled or poached. Bacon or ham. Fresh white fish. Game. Meat. To be avoided: oatmeal and other kinds of porridge, bread-and-milk, bread in any quantity, sugar, preserves in every form (pp. 475, 476, 477).

Luncheon (five hours after Breakfast).—Of not more than three courses, selected from the following list: Meat—the most digestible kinds (see Chronic Indigestion, page 467), chicken, game, fish. Bread as at breakfast. Spinach, asparagus, seakale, artichokes, a tablespoonful of potato put through a sieve; cooked greens—cabbage, broccoli, cauliflower, sprouts—very sparingly only, after improvement. Cheese very sparingly. Half a tumbler of water at the end of the meal. To be avoided: bread in quantity, potato in quantity and in mashed form; sweets of all kinds, unless prepared with saccharin; all farinaceous puddings and other dishes; sugar; alcoholic beverages of every kind (pp. 474, 477).

Tea (four hours after Luncheon).—A single small cup of tea or cocoa as at breakfast. Bread and butter or biscuit as at breakfast.

Dinner (two hours after Tea). As at Luncheon; but four courses allowed. Custards boiled or baked, apples stewed with saccharin, other fruits stewed with sodium bicarbonate, cream very sparingly. Savouries very carefully ordered. For dessert: banana, almonds. One or two glasses of dry natural sherry. Half a tumbler of water at the end of the meal. To be avoided: soups, as well as the articles forbidden at luncheon.

2. *In the advanced stage of actual obstruction at the pylorus.*—Peptonised milk, peptonised cereal preparations, eggs, meat-teas and -essences. If these be rejected or disagree, feed *per rectum* (p. 476). Selection of preparations for rectal alimentation: see Gastric Ulcer, page 493.

Medicines.—Various gastric disinfectants: See Chronic Gastric Indigestion, page 469. For severe pain: A gastric anodyne: (1) ℞ Liquoris Morphinæ Hydrochloridi ♏xx-xl, Aquæ Camphoræ ℥i. [U.S.P. ℞ Morphinæ Hydrochloratis gr. $\frac{1}{5}$-$\frac{2}{5}$, Aquæ Camphoræ ℥ii, Aquæ Destillatæ ad ℥i.] When required. (2) Morphine hypodermically.—For attacks of severe vomiting: Various gastric sedatives (p. 478): (1) ℞ Bismuthi Subnitratis gr. xx. To be given at once in water or milk. (2) ℞ Bismuthi Subnitratis gr. xx, Acidi Hydrocyanici Diluti ♏iii, Tincturæ Cardamomi Compositæ ℥i, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Bismuthi Subnitratis gr. xx, Acidi Hydrocyanici Diluti ♏iii, Tincturæ Cardamomi Compositæ ℥i, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ℥iii.] At once, and repeated every three hours if necessary. (3) ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏xx, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏xx, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ℥iv.] At once, and repeated if necessary in an hour. (4) Antacid lozenges; see page 469. (5) When associated with pain, see above.—Nervo-muscular tonics of the gastric walls for regular use (p. 474): (1) ℞ Liquoris Strychninæ Hydrochloridi ♏iv, Acidi Nitro-hydrochlorici Diluti ♏x, Tincturæ Aurantii ♏xxx, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{28}$, Acidi Nitro-hydrochlorici Diluti ♏x, Tinc-

turæ Aurantii Amari ℥xxx, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ℥iv.] Three times a day three hours after meals. (2) ℞ Tincturæ Nucis Vomicæ ℥v, Sodii Bicarbonatis gr. x, Spiritus Ammoniæ Aromatici ℥xx, Infusi Gentianæ Compositi ad ℥i. Three times a day five minutes before meals.—A Purgative regularly, as required. See p. 468.

Non-medicinal Remedies.—Lavage (p. 475), using recently boiled water at 90° F. with either:—sodium bicarbonate, 2 to 4 per cent; or boric acid, 3 per cent; or common salt, 1 per cent; or salicylic acid, ·5 per cent; or a very weak solution of potassium permanganate. — Surgical measures (p. 474). Exercise and hygiene in general (p. 475).

CHAPTER XXIII.

GASTRIC ULCER.

The principles which guide us in the treatment of gastric ulcer are thoroughly rational. They are derived almost entirely from the pathological characters of the disease, and broadly speaking are not different from those which direct the surgeon in healing an ulcer of the leg. Unfortunately we are still ignorant of the causes of gastric ulcer; but what we do understand of the mode of its origin is available for therapeutic application. Second only in value to the pathological indications, especially when associated with them, as guides, are the therapeutic suggestions urgently given us by the pain and vomiting which characterise the disease clinically, and by the course which it follows. Regarded as a whole, there are few diseases that impress more strongly on the student and the young practitioner some of the leading principles of sound treatment.

Ætiological Indications.—The origin of gastric ulcer is still obscure. The generally accepted view is that the efficient cause is the gastric juice, which acts upon an area of the wall of the stomach, the resistance of which has been reduced by some failure of nutrition; and that the occurrence is determined by certain events which precipitate or aggravate the disturbance of the local blood-supply or injure the gastric mucosa. The wall of the stomach possesses natural resistance to the action of the gastric juice; but if on the one hand the secretion become too abundant or too powerful, or if on the other hand the vitality of an area of the mucous membrane be lowered, and still more if the two circumstances concur, a

process of self-destruction sets in. About the part played by hypersecretion or hyperacidity of the juice, or indeed by the juice at all, in originating ulcer of the stomach, there is still much doubt; and the subject cannot be discussed here with any profit. It is also doubtful whether we can profitably attempt to reduce the hyperacidity of the gastric juice in these subjects, although alkalis after meals or acids before meals have theoretically this effect.[1] On the other hand, the proclivity, predisposition or vulnerability of the gastric wall, rewards inquiry from the therapeutical point of view, as it furnishes many suggestions for remedy and prevention; and the disease being essentially recurrent, there is much opportunity of exercising precautionary measures. This loss of vital resistance of the walls of the stomach may sometimes be traced to direct injury. Women who have once suffered from gastric ulcer ought, therefore to avoid irritant and indigestible food of every kind. This is no easy matter. These subjects are not usually dyspeptic; they have a disposition to yield occasionally to the cravings of appetite: and they commonly belong to a class (domestic servants) who have but little choice. It would also be well for housemaids, who do so much of their work in the stooping posture, to avoid the pressure of corsets which might injure the stomach. Greater importance has been attached to interference with the blood-supply of the walls of the stomach as predisposing to ulcer. The nutrient arteries may fail in general anæmia (age, sex, occupation); in cachexia (advanced age, syphilis, etc.): by way of embolism or thrombosis; and by the occurrence of spasm, reflexly set up, particularly from the pelvis and in relation to menstruation. We find in these considerations abundant reason for exercising care of the stomach in anæmic young women, who so often suffer from constipation and uterine disorder; and in debilitated and senile subjects. Most important of all, however, from the prophylactic point of view is it to remember the low nutrition of the cicatricial tissue which represents the seat of previous ulceration. Like the cicatrix of a chronic ulcer of the skin, like an adherent and thickened appendix, like a scar on a

[1] Is the craving of some young women for vinegar, pickles, oranges, and other acid substances a natural provision for reduction of hyperacidity?

cardiac valve, the imperfectly organised fibrous tissue of an old gastric ulcer falls an easy prey to pathogenetic influences. We find here part at least of the explanation of the recurrence of the disease, and a principal argument in favour not only of prolonged protection of the stomach whilst the general nutrition of the tissues is being improved in convalescence from the acute phase of ulceration—obviously a delicate and difficult combination of objects, which will occupy our attention presently—but also of maintenance of the general nutrition at the highest possible level.

Pathological Indications.—The first indications for the treatment of an active ulcer are to arrest the destructive factor and to promote but control the conservative and constructive factors of the disease. It is an encouraging consideration that these ends are often attained spontaneously. This is proved by the fact that cicatrices of ulcers are occasionally found in the stomach *post mortem* without any history that the disease had been diagnosed or treated.

With respect to the destructive factor, we have to remember that ulcer of the stomach, whatever its origin may be, spreads in depth and area by peptic digestion; that if an artery be struck in its course, hæmatemesis will result: and that if the peritoneal coat be invaded, the process may be so rapid that perforation occurs. Side by side with the necrotic change is the process of regeneration. Whilst this tends to repair the damaged area, to thrombose and occlude threatened vessels, and to establish protective adhesions of the peritoneal surface with neighbouring parts, it leaves a fibrous scar in the parietes which may pucker the surface, pouch the cavity of the stomach, stenose the pyloric orifice, and itself possess so little nutritive vitality that it is very readily attacked again by the gastric juice, as we have seen, and permits recurrence. In other words spontaneous repair, whilst it does occur, sometimes entirely fails; it is usually slow, and therefore "weak"; and it may run into very unfortunate results, particularly if the ulcer extend deeply and widely. From this we are bound to conclude that we must not only arrest the ulcerative process, but do so *as quickly and soundly as possible*. We should thus anticipate both serious

damage and the unfortunate results of entirely spontaneous repair.

The principles of treatment which are to be employed are not different in ulcer of the stomach from those at which we arrived in the first part of this work under the head of Inflammation. The student who has intelligently attended to the healing of an ordinary chronic ulcer of the leg in the out-patient room should have no great difficulty in planning the treatment of an ulcer of the stomach. Yet how often are the fundamental laws and rules of repair which were learned in the former case ignored in the latter! The first and most important of all the pathological indications is to secure immediate, complete and prolonged rest—of the body as a whole, and of the stomach in particular. Bodily rest in bed quiets the arterial circulation, promotes the return of venous blood from the stomach, and diminishes the respiratory movements of the diaphragm and abdomen. The *rationale* of gastric rest will be presently discussed in connexion with the clinical indications, the symptoms and signs being the guides to the employment of diet; but here we may say, in passing, that by stopping the acid secretion it directly interrupts the destructive factor of the pathological process. The second method at our disposal is to increase tissue-resistance through the blood, by means of nutritious food, fresh air and efficient elimination. Here we meet with a practical difficulty: we have to feed the ulcer but rest the stomach, for we have just seen that the stomach must be relieved of work and the patient keep her bed. We are compelled to effect a compromise by insuring that the food, whilst it is given in such form and amount, and possibly by such a channel (the rectum), that the stomach is comparatively undisturbed, shall consist of the most nutritious materials, such as milk and eggs; that the room shall be thoroughly ventilated, and the bowels regularly moved. When the stomach comes to tolerate food, it is still to be given of a highly nutritious quality; and then small doses of iron might also be cautiously ordered. The third method of favourably influencing the ulcerative process is by promoting healthy vascular reaction in the walls of the stomach, and thus quickening local nutrition. Warm fomentations, leeches or blisters,

as respectively indicated in different instances, might be applied to the epigastrium. Bismuth appears to have a local effect on gastric ulcer, probably as a very mild stimulant, like zinc oxide, which also has been employed in obstinate cases. Silver nitrate is sometimes given in the form of a pill; but perhaps more benefit might be expected from a solution of gr. $\frac{1}{4}$ to gr. $\frac{1}{2}$ in an ounce of distilled water, taken on an empty stomach by the patient whilst lying on her right side,[1] for it is known that fluids hastily swallowed may gravitate quickly to the pyloric region.[2] Fourthly, treatment must be continued strictly for a sufficient length of time to complete healing and insure a good cicatrix. Twenty days appear to be the *minimum* period required to heal a gastric ulcer;[3] but six weeks ought always to be allowed, even when the case is doing well. Lastly, as we have already seen in connexion with the ætiology, the lowly organised cicatrix must be nourished and protected for an indefinite length of time, particularly against the causes of malnutrition, that repair may be durable and thus recurrence of the trouble prevented. We shall have to consider this indication very strictly under Convalescence.

Clinical Indications.—The clinical phenomena of gastric ulcer, particularly pain that is increased by movement and food and relieved by rest and vomiting, sickness, tenderness on pressure, and loss of strength and substance, are unusually plain and safe guides to the activity of the pathological process on which they depend; and they may therefore be employed with confidence to furnish symptomatic indications for treatment in the correct sense of the term. The interpretation of these symptoms and signs introduces us again to active destruction in the form of ulceration, increased by bodily unrest, circulatory and respiratory excitement, and functional activity of the stomach. We are now in a better position to discuss the value of rest and the importance of regulating it by pain and vomiting.

Complete bodily rest in bed for a period of several weeks

[1] A. H. Smith, *Med. News*, Phila., May 17th, 1890.
[2] Percy Duncan, *Lancet*, London, 1890, vol. i. p. 798.
[3] Duncan, *loc. cit.*

is plainly indicated in many cases of gastric ulcer by the fact that pain disappears in recumbency and returns with attempts at movement, until a sufficient time has expired to repair the ulcer, whereupon the patient rises without discomfort of any kind. Rest is automatically secured by the pain; and as a matter of experience it proves successful. In the active phase of the disease rest must be complete. In more quiescent phases less extreme measures suffice, such as resting on a couch, walking quietly about the house, or even doing light work. When we wish to know whether rest is to be instituted, or modified, or stopped, or to what length and degree it is to be carried, we have only to use the plain guide to the state of the ulcer which is at our service, namely the presence or absence of pain, and to regulate our treatment accordingly. For instance, reappearance of pain when the patient is moved to a couch must be unhesitatingly followed by return to bed for a short time, after which the experiment would be repeated.

Functional rest of the stomach also is plainly indicated by the clinical phenomena: by the definite increase of pain which follows ingestion of food, particularly less digestible kinds and forms; by the occurrence of vomiting which ensues; and by the relief of pain which is then speedily obtained. But we have seen that at the same time the urgent indication for nourishment furnished by ulceration must not be overlooked. The work of the stomach is reduced by ordering fluid food in small quantities, but it will be given very frequently, that is at short intervals, and be predigested and as nutritious as possible. The evidences of success in feeding are as obvious as those of the value of rest—the absence of pain and vomiting with relation to food. If these disappear, the diet suits the stomach; if they distinctly return or increase after food, this must be simplified more and more: if the symptoms still persist, rectal alimentation must be instituted and the stomach allowed absolute rest. It is important to understand what physiological rest means in the case of the stomach. First, there is an end to physical irritation and distension of the gastric walls, including the ulcerated surface, by food and its gaseous products. Secondly, the churning and propulsive movements, as well as vomiting, which involve strain and

injury of the diseased area, are diminished or arrested. Thirdly, functional rest checks the acid secretion of the peptic glands, which aggravates the destructive element of the process, if it do not actually cause or constitute it. Lastly, physiological rest prevents the sudden periodic hyperæmia which accompanies digestion.

The means of securing these highly desirable effects are ready to our hand. The most satisfactory of all is rectal feeding with peptonised milk, eggs and broths, or with suppositories of peptonised meat. If pain or vomiting be very severe and persistent, and especially if hæmatemesis occur, this course must be followed unhesitatingly. Experience shows that patients can be kept on nutrient enemata for several weeks, and get comfort, a sense of satisfaction and strength from them, although as a rule losing weight. In milder cases two ounces of peptonised milk or other suitable kind of fluid nourishment are usually quite well borne by the stomach every few hours. The milk is predigested by being peptonized: there is no digestant preparation, solid or fluid, given along with it, which might aggravate the disposition of the gastric juice to attack the ulcer. Unfortunately several difficulties attend the application of the principle of rest in practice. First and perhaps chiefly, the method is too commonplace to gain the respect of certain classes of patients, who behave like Naaman the Syrian and look to be cured by some much more striking means. The very simplicity of it constitutes a serious drawback to its employment. Again, it often proves irksome to the patient, who either would prefer pain to enforced "idleness and starvation," or may resent rest as being no longer necessary the moment pain is relieved. We have already seen that much of the value of rest in gastric ulcer depends on its being prolonged, in order to effect something more than simple healing over of the broken surface, namely, thoroughly sound repair and complete cicatrization which will insure it against breaking down again on slight provocation. Patience, resolution and perseverance are demanded indeed both of the patient and the practitioner, and the influence of the latter is often severely strained. Of the two measures, rest and strict diet, the latter is to be first relaxed. When gastric feeding

is resumed, it should at first be in addition to rectal alimentation, the bowel being trusted to whilst the experiment is cautiously made. Experiments in feeding should also precede experiments in movement, so that the patient may have taken a little solid food and gained a little strength before sitting up.

Palliative treatment.—Relief of pain, vomiting and other kinds of distress is best afforded by regarding them symptomatically in the proper sense of the term, and attending to the indications which we have just discussed. The question whether more than this is necessary involves a discussion of the value of drugs in the treatment of gastric ulcer. Naturally the practitioner is inclined to give medicine of some kind; the patient unfortunately expects it, and, as we have seen, has little confidence in treatment without it. Now if the principles which we have reached above are sound, rest is the correct method of checking ulceration of the stomach; and it is entirely incorrect to relieve pain and vomiting, say by means of opium, and permit the woman to work. Yet this is not infrequently done: patients with active gastric ulcer come to dispensaries and out-patient rooms for medicines which are practically gastric anodynes and enable them to do themselves harm. There are other objections to this system. It is a recognised occasion for development of the morphine habit; and a woman with a chronic ulcer which has never been systematically treated as a surgeon would treat a chronic ulcer of the leg readily drifts into hysteria. We have here an instructive illustration of one of the evils of taking pain or other clinical phenomenon as a therapeutic guide without interpretation of its significance.

In spite of all these considerations, however, chronic cases are undoubtedly met with in which the patient's circumstances and other conditions necessitate an appeal to other measures than rest and diet, or to drugs along with these in a modified form. In this event it will be well to study the patient's temperament, which often proves to be neurotic. Bismuth has been already referred to under pathological indications. Diluted prussic acid is a pure gastric sedative, to which no exception could be taken. Alkalis suit other cases, particularly

if there be associated catarrh; lime water may be given with milk. External applications, including blisters and leeches, have been variously regarded by different authorities.[1] Other measures will suggest themselves, particularly for the arrest of sickness, including ice externally or internally, tincture of iodine in water,[2] and phenol; and a more varied diet.

COMPLICATIONS.—The two complications of gastric ulcer calling for serious consideration are perforation and hæmatemesis. *Perforation of the stomach* is referred to under Acute Peritonitis. It demands immediate laparotomy.

Hæmatemesis.—This alarming complication might be more often prevented if the mode of its occurrence were considered with greater care. The bleeding of course proceeds from an artery that is laid bare by the ulcer in its progress through the gastric walls; but there is clear evidence that the actual event is not erosion of the vessel from without, but rupture from within under the influence of the blood pressure. This distinction might appear to be a useless refinement, but on the contrary is of vital importance practically as an indication of the means of prevention. Hæmatemesis in gastric ulcer occurs, with few exceptions, at the menstrual period, when blood pressure is known to be high, and in the midst of work which involves stooping and holding the breath or actual exertion. It ought therefore to be a cardinal point in the management of gastric ulcer to forbid work of every kind during menstruation, at any rate if there be evidences of activity of the disease, and for several months after the woman's recovery from the acute phase of the disease.

The remedial treatment of hæmatemesis in gastric ulcer illustrates the principles which we reached in our study of hæmorrhage in the first part of this work. It would be useless to attempt to close the broken and bleeding point by pressure. We must trust mainly to the reduction of the blood pressure, and in small measure to astringent and constringent drugs. Rest is the most powerful means to employ. It is indeed

[1] Fagge objects to blisters, "Principles and Practice of Medicine," 3rd edit. 1891, vol. ii. p. 188. Wilson Fox advises leeches, "Diseases of the Stomach," 1872, p. 180.

[2] F. Taylor, *op. cit.* p. 544.

already secured by faintness or actual syncope. The patient is probably found unconscious and motionless on the floor, with scarcely perceptible pulse. The danger is extreme in itself, but it is often increased by injudicious management. The first thought of a patient's friends under the alarming circumstances is to carry her upstairs to bed and undress her; the second to give her nourishment. Syncope, possibly fatal, is the likely result; if not this, fresh hæmorrhage from the stomach. It need hardly be said that if the first principles of dealing with hæmorrhage are to be respected, the patient must be treated where she is found and as she is found, and ought to remain there perfectly undisturbed until, after several hours, arrangements are made to have her lifted on a stretcher to a more convenient place. Complete bodily rest is thus obtained, and is maintained by a sensible friend or nurse being given charge of the patient and attending to the ordinary duties of the sick-room. Physiological rest of the stomach is rigidly enforced according to the principles already laid down, and by the same means, nutrient enemata being commenced after some hours, and only an occasional teaspoonful of hot water or a small piece of ice given by the mouth, or normal saline solution *per rectum*, to relieve the intense thirst.[1] Physical, physiological and mental rest are secured together by giving a hypodermic injection of morphine.

Hæmatemesis is sometimes so profuse that the condition of the patient is desperate, or she dies very quickly. A case of this gravity demands an effort to restore the heart by means of injections of brandy or ether into the rectum; but we may find on making the attempt that the hæmorrhage has already reached the lower end of the intestine, which must be full of blood. Hypodermics of strychnine or ether ought to be given, and transfusion might be attempted.

If the measures employed have been successful in averting death and preventing fresh hæmorrhage, they ought to be continued for several days, the severity of them being very cautiously relaxed. The patient must be kept at absolute

[1] Very rarely indeed enemata have to be discontinued on account of alarming faintness induced by every attempt in this direction. The patient must then be fed by the mouth, exercising extreme care.

rest, mentally and bodily, and fed by the bowel. Morphine or opium may now be given in the nutrient enemata; but if bleeding return, a hypodermic injection should be immediately administered, combined with solution of strychnine hydrochloride. Repeated recurrence would naturally suggest other lines of treatment; and it is under these circumstances that hæmostatics of a specific or direct kind ought to be employed —ergotin with the syringe, tannic acid by the mouth, or lead acetate. It is as difficult here as it is in other forms of hæmorrhage to say how far these drugs deserve the credit of having arrested the bleeding. The broken vessel being an artery, and the blood pressure already precariously low, there is a plain indication not to purge the patient, and movement of the bowels would be calculated to disturb the clot on which repair depends. In the course of a few days, the general management of the case is that which we have already seen to be proper for active gastric ulceration.

There are but few women with gastric ulcer who are free from headache and constipation. These troubles sometimes may be relieved together by the daily use of saline purgatives in hot water, occasionally preceded by calomel. During rectal feeding the bowels usually "manage themselves." Later on, when the patient is up and about again and taking solid food, iron may be added to the morning saline with good effect and also as a hæmatinic.

Indications from the Course.—Most of the therapeutic lessons which are to be learned by an intelligent study of the course of active gastric ulcer have been already considered, particularly in connexion with the proper fulfilment of the principle of rest. One or two other points require notice.

During convalescence from the acute phase the pallid face, sunken eyes, debility, wasting and history of comparative starvation suggest hæmatinics; and healing is calculated to be expedited by the same means. But great caution must be exercised in this attempt. Only a little iron in a bland form is to be prescribed at first; and it is to be stopped if the smallest symptom of gastric irritation occur. The causal relation of *menstruation* to this disease is generally

recognised, although it may be difficult to formulate; at least there can be no question but that hæmatemesis very frequently coincides with the menstrual period. We have therefore to take special care of our patient at the approach of the next catamenia. If she have reached the stage of sitting up, she must return to bed for a few days.

Before the patient finally leaves the practitioner's hands, a few plain words of counsel and warning for the future should be addressed to her. Bearing in mind the classical paradox of Niemeyer that "chronic gastric ulcer is an acute disease,"[1] we first try to impress upon her the conviction that her trouble will return unless she exercise scrupulous care to prevent it, and that it will return in an active form. The success of the simple method of rest and dieting in the attack through which she has just passed must next be brought clearly before her mind; and she may then be able to appreciate and remember the advice which follows: that she must observe the same rules for a considerable length of time, namely, to employ gastric pain as a simple and infallible guide to her management of herself in respect of work and diet, indeed as a danger-signal. Definite reference will also have to be made to future menstrual periods, when she is to remain as quiet as possible whether there be gastric pain or no, and on no account to exert herself by lifting or moving heavy articles, nor to work in stooping, bent or other awkward postures. Unhappily most of the subjects of this disease are young women who have to work for their living and either eat ordinary diet or go without. If they did not follow the latter alternative and comparatively starve themselves, as they often do from fear of pain and in spite of hunger, gastric ulcer would be a more serious disease in its results even than it is at present. Unfortunately they cannot afford to abstain from work in a similar way; but well-to-do women with this complaint might at least avoid exertion in the form of dancing, hunting and other active amusements, and be careful to dress in such a fashion as would save the stomach from injurious pressure.

[1] Niemeyer "Practice of Medicine," 1869, vol. i., p. 504.

Outline of Practice.

I. Commencement of the Case.—*General Management.*—Rest in bed, in room, or indoors, according to the presence and severity of epigastric pain. Whatever in the way of movement increases or induces pain is wrong and must not be repeated (p. 486). No patient genuinely requiring treatment is to be allowed to work; nor to visit the doctor. *Diet.*—Fluids only (p. 486), in small frequent quantities—2 fluid ounces every hour. Two feeds of peptonised milk to one of beef tea. If pain continue, 1 fl. oz. feeds of the same every half hour. If pain still continue, feed *per rectum* only, every four hours day and night (p. 487). *Nutrient enemata:* (1) Peptonised milk 4 fl. oz., half a yolk of egg; (2) Peptonised beef tea 4 fl. oz., half a yolk of egg; (3) Solution of Ferric Chloride 10 minims combined with either (1) or (2). Given alternately. Nutrient suppositories of peptonised beef. The rectum washed out at commencement, and each morning, with 1-2 pints of warm boric acid (4 per cent) lotion.—Thirst relieved with sips of quite hot water; by moistening mouth and lips with acidulated barley water; or (better) by a warm rectal injection of 1 teaspoonful of common salt in a pint of water. *Stimulants,* if urgently indicated, to consist of 1 to 4 fl. drachms of brandy given in each enema.

Medicines.—None as a rule (p. 488). Distress to be borne for a few hours, when effects of rest and proper feeding will begin to be appreciated.—For persistent pain or sickness: ℞ Bismuthi Subnitratis gr. xx, Pulveris Tragacanthæ Compositi gr. v, Acidi Hydrocyanici Diluti ♏iii, Aquæ ad ʒi. [U.S.P. ℞ Acidi Hydrocyanici Diluti ♏iii, Bismuthi Subnitratis gr. xx, Pulveris Tragacanthæ gr. i, Pulveris Acaciæ gr. i, Pulveris Amyli gr. i, Sacchari gr. iii, Aquæ ad ʒi.] Every four hours.—For severe constipation (p. 491): ℞ Hydrargyri Subchloridi gr. ii, Sacchari Lactis gr. ii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. ii, Sacchari Lactis gr. ii.] At once; to be followed in six hours with a saline purgative in small bulk. The saline to be repeated every other morning, the calomel once a week only if required. *Local measures.*—Leeches,

blisters, or fomentations to the epigastrium, or anodynes on spongio-piline (p. 489).

II. Progress of the Case.—*For at least seven days,* this system strictly followed.—If pain and sickness have ceased, expedite healing by internal medication (p. 485): (1) ℞ Bismuthi Subnitratis gr. xx. In a little water or milk every four hours. (2) ℞ Argenti Nitratis gr. ½, Aquæ Destillatæ ʒi. On an empty stomach, once a day; the patient lying on the right side. *In Hæmatemesis.*—See p. 489.

On the 14th day, pain and sickness being controlled, advance the diet (p. 487): Ordinary milk, milk and saccharated lime water, or milk thickened with arrowroot or bread or biscuit crumb, to be substituted for peptonised milk; and the size of each feed increased from a half to 1 fl. oz.; from 1 fl. oz. to 2, and so on. If rectal feeding hitherto, this to be continued whilst half oz., 1 oz., etc., feeds of peptonised milk are given and effect noted (p. 488). Should pain return, resume rectal feeding only. If no pain, advance feeding by mouth as suggested, and gradually reduce number of enemata or suppositories. *In Perforation.*—See p. 543.

On the 21st day—all going well and patient taking semi-solid food—let her sit up in bed, with warm covering to shoulders, for a few minutes. If no pain, increase period of movement daily. By this time, bread and butter, sweetbread, eggs, milk puddings and boiled fish may be tried; later still, chicken and tender lean mutton. In a few days, all going well, lift her on to a couch for half an hour. If pain come on, return her to bed at once, and avoid further experiments for a few days.—If no pain from sitting up, increase duration of it; and presently let patient stand; and then gradually walk. Pain to be signal for return to bed (p. 486).—At menstrual period patient to be kept strictly to bed for several days, however well (p. 492). *Medicines.*—Mild hæmatinic to be given very cautiously from the date of successful sitting up (p. 491): ℞ Ferri et Ammonii Citratis gr. v, Glycerini ♏xx, Aquæ ad ʒi. Three times a day immediately after meals.

III. *Directions for convalescence* and for preventing *return of ulceration,* see pp. 482, 489, 492.

IV. In obstinate chronic cases (p. 488). Occupation or work of an easy kind, short of producing pain. *Diet.*—Comparatively small light meals, at short intervals. Example of a dietary:—7 A.M. Sip a cup of hot water with or without Carlsbad salts. 8 A.M. Yolk of a poached egg; stale bread and butter; cup of milk and Bermuda arrowroot. 11 A.M. Cup of peptonised food. 1 P.M. Boiled mutton, chop, or boiled chicken; spinach; stale bread. 4.30 P.M. Cup of peptonised food; bread and butter. 7 P.M. Yolk of a poached egg; bread and butter; cup of milk and arrowroot. 10 P.M. Cup of water.

CHAPTER XXIV.

ENTERIC CATARRH—DIARRHŒA.

A STUDY of enteric catarrh serves to impress on our minds several important considerations which bear upon general therapeutics. The relations of the different causes to the disease are usually direct and readily appreciated, and the value of attention to ætiological indications is correspondingly intelligible. One of nature's elementary methods of resistance, removal of the irritant material, is seen actively at work, but at the same time the necessity to control it is strikingly exemplified. Two of the most familiar means of treatment, rest and regulation of diet, are employed in this disease with the happiest results. A study of acute enteritis as a whole also teaches us not to confine our attention in therapeutics to prominent phenomena only, such as diarrhœa, nor to be satisfied with attributing remote effects of disease entirely to the local disturbances however severe. Toxæmia plays a leading part in some of the worst cases of enteritis; and the importance of the primary indication to sustain life or avert threatening death could hardly be better illustrated than by a study of this disease.

ÆTIOLOGICAL INDICATIONS.—*Preventive Treatment.*—The causes of enteric catarrh concern the practitioner in so many ways—in respect of the dietetics of health and disease, the uses of medicines, and the pathology and treatment of affections other than those of the alimentary canal—that the prevention of it claims a brief notice from us, as well as its remedial treatment. Most of the causes of diarrhœa are now familiar even to the laity, although the intimate nature

and mode of action of each of them may not be perfectly understood by ourselves. Recent advances in bacteriology, particularly in relation to the processes and products of fermentation and decomposition, have added greatly to our knowledge of this subject. Enteric catarrh is obviously to be prevented by avoiding, removing or destroying the causes of it before they have come in contact with the body. This will be done mainly by attention to food and other ingesta. Food must be, first of all, food that is fit for food—which in the case of hand-fed children and the poor it very often is not —and in good condition, particularly meat, milk, vegetables, fruit, preserved provisions, and fermented beverages. The dangers of simple excess, of imperfect cooking and of gastric indigestion as causes of enteritis need hardly be mentioned. Special care has to be exercised in hot weather and in warm climates, which favour the activity of micro-organisms and are thus exciting causes of diarrhœa. Some persons are predisposed to the disease by delicacy of the intestinal structures, namely, infants, children, the subjects of organic affections of the alimentary canal, and certain individuals who recognise their liability to looseness of the bowels on slight provocation. All these will require special protection. With respect to poisons, the practitioner must not forget that in addition to actual purgatives, given deliberately as such, some of our most useful drugs have to be prescribed with care because of their irritant action on the intestine. Digitalis, squill, ammonium carbonate and arsenic are instances in point.

Remedial Treatment.—When the cause has entered the body and acute enteritis has already begun, the first indication is to remove the offending agent. The simplest way to do this is to permit the diarrhœa to continue, care being taken to control it if the number of motions or the severity of constitutional disturbance exceed certain limits. An even more successful method of treatment, and one frequently followed in simple cases, is to encourage or increase the intestinal discharges with purgatives. The irritant has to be evacuated before other important indications can be fulfilled; and at the cost of temporary aggravation of the condition, we purge the patient, being careful to select such remedies

as are first mildly purgative and afterwards astringent or sedative in their action. Three familiar drugs fulfil these conditions,—castor oil, rhubarb and mercury. Castor oil is particularly indicated in the intestinal catarrh of children produced by eating unripe fruit. It acts speedily and very gently, and its subsequent effects are neither continued relaxation nor depression, but the opposite. Rhubarb is prescribed under similar cases in the form of Gregory's powder; and, in combination with soda, ginger and a trace of grey powder, is given very extensively to infants with gastro-enteric trouble due to improper feeding. Calomel is especially valuable when the stomach is irritable. An interesting use of mercurials for diarrhœa may be studied in connexion with gout. Gouty subjects are sometimes stricken with a severe, depressing and protracted kind of diarrhœa for which every astringent is given in vain, and every other means employed without effect, until the cause has been discovered. A few small doses of calomel, along with rest and suitable diet, quickly answer. Blue pill is another excellent medicine under these circumstances, or a pill containing grey powder; or in less urgent cases Plummer's pill taken every second night until six have been used. A mild mercurial purge is also invaluable in the treatment of irritability of the bowels and loss of appetite so frequently met with in protracted cases of disease, such as pulmonary phthisis, and really due to over-feeding. No doubt these drugs are more than purgative in action: they are also disinfectant, as we shall presently see; but they serve to illustrate the radical method of removal of the cause. On the same principle we treat the fluxes from the bowels which occur in the mechanical congestion of cardiac failure in valvular disease, emphysema and chronic nephritis. The flow of water into the bowel is not to be checked as long as the cause of it remains. Indeed the practitioner learns to encourage a flux that is the natural counterpart of the method of hydragogue purgation which he employs for ascites and anasarca. He therefore meets it with a regular morning dose of compound jalap powder or with a mercurial. There are other classes of diarrhœa in which the cause must be directly removed before success can be obtained. Of these one of the most

instructive to the young practitioner is the profuse and possibly prostrating flow of liquid fæces which occasionally sets in in fæcal accumulation. After trying in vain for several days to arrest diarrhœa of this character in an old man by means of all the astringents at his command, including opium, he discovers on passing his finger into the rectum a malignant stricture and beyond it a collection of scybala and fæcal mud; and a few well-planned purgative enemata, in imitation of the natural provision which has been affording partial relief, give a satisfactory result.

But it is not always possible or advisable to remove the cause of enteric catarrh. Purgation is disagreeable; sometimes it is dangerous; and we shall presently find that rest of the bowel is indicated, if rest can be given whilst the source of unrest remains within it. This end is secured by destroying the cause *in situ*. The simplest means that possess this action are alkalis and alkaline earths, including soda, chalk, lime-water, magnesia, which (besides their respective specific actions) appear to neutralize the irritant acids generated in the decomposition of food, and possibly prove inimical to certain micro-organisms. These drugs are extensively and successfully employed in the treatment of diarrhœa at all ages. Disinfectants are still more powerful means of treating enteritis by destroying its cause locally. We have seen that the effect of mercurials is partly to be accounted for in this way. Perchloride of mercury in solution and the other preparations already mentioned may all be employed in different cases. Thymol, turpentine and the many other essential aromatic oils, camphor, naphthol, phenol and creosote, salicyl compounds (particularly salol), solutions of chlorine and others have been extensively used within the last few years.

Even when the cause of diarrhœa is remote from the bowel and independent of the ingesta, it must still be dealt with directly, if possible. In connexion with Graves's disease, or with passing anxiety, it may be of nervous origin and yield to measures directed to the brain, including "moral" treatment and bromides. We have already referred to renal and cardiac disease. The liver is often the seat of the primary cause of enteritis, whether it be actually diseased as in cirrhosis or only

disordered. No doubt a third way in which mercurials are so useful in diarrhœa is by their action on the biliary functions.

Pathological Indications.—In the treatment of diarrhœa the leading indications derived from a study of the pathological anatomy of catarrh have to be closely followed. The first of these is to deal with the destructive factor of the morbid process. This is done mainly by attending to the cause itself, as described in the preceding pages; partly by fulfilling the next indication. Our second object is to promote the conservative factors of the morbid process, particularly repair: those factors by which, after all, many cases of this disease speedily recover under domestic treatment and nothing more. The most important measure to promote this object is rest: rest of the body as a whole, and physiological rest of the bowels. Bodily rest in bed is curiously neglected in the treatment of even severe attacks of diarrhœa. It is often the key to the problem of recovery. Warmth is afforded by the same means. Physiological rest of the bowel is secured by their evacuation and attention to the food—with respect to kind, form, quantity and temperature, as we shall presently see. If these measures fail and the inflammatory process continue to be attended with restless peristaltic movements, recourse must be had to more powerful medicinal sedatives. Opium or morphine, in one or other of their many pharmaceutical preparations, will usually be selected. Opium with chalk, with kino, and with lead belong to different types of combinations which may be given by the mouth; an enema containing tincture of opium, or the compound lead suppository, by the rectum. In conditions of great irritability of stomach and bowel the hypodermic injection of morphine may be necessary.[1]

The third pathological indication is to control the circulatory reaction and circulatory disturbance generally which form an element of the catarrhal process. As we saw in connexion with the ætiology of the disease, we permit a certain amount of watery flux (exudation) from the vessels, or even encourage and increase it. Part of the benefit of purgation at the commencement of diarrhœa may probably be thus accounted

[1] K. Macleod, Art. "Cholera," Allbutt's "System of Medicine," vol. i. p. 912.

for: it drains the engorged vessels of the mucosa. Warm applications to the abdomen, in the form of light poultices or a flannel roller, unquestionably are useful in some kinds of diarrhœa. Bismuth oxynitrate, freely given, appears to act as a direct sedative to the inflamed surface here as elsewhere. Zinc oxide is ordered for children. But when the acute phase of the inflammatory process reaches its height, and the drain of fluid is excessive, vascular astringents or constringents may have to be given. The most powerful of these is lead as the acetate, dissolved in water with the aid of diluted acetic acid, and usually combined with morphine acetate to fulfil other indications. This combination is rarely employed except in cases otherwise urgent, for example in typhoid fever with or without hæmorrhage. Alum, diluted sulphuric acid, and alum combined with sulphuric acid and a variable amount of magnesium sulphate are other means of securing the same object. In addition to these, we possess the large group of vegetable constringents with tannic acid as their chief basis such as catechu, kino, rhatany, logwood and the rest, in many forms, with and without opium. These vegetable constringents would appear to exert a beneficial effect also on the glandular and other tissues of the intestinal walls.

The fourth pathological indication is to promote removal of the morbid products. We find here a third and chief reason for permitting a moderate amount of diarrhœa to continue, that is, another reason against the not uncommon practice of at once locking up the bowels in diarrhœa. The dejections drain the inflamed parts, and clear the bowels not only of the cause but of the products associated with the catarrhal process, which are undoubtedly morbific both locally and if absorbed into the blood. It will be gathered from this discussion that there is, or appears to be, a clashing of indications in the treatment of intestinal catarrh. The bowels have to be at one and the same time set at rest and drained by their own peristaltic movements. We cannot ordinarily drain them by means of a tube as we drain an abscess in a limb resting in splints, but this severe measure is now employed in desperate cases of intestinal accumulation and tension associated with peritonitis. We have to settle this

a real practical difficulty, by allowing a certain number of motions and no more; and by exercising our best judgment in each individual case after a careful estimate of the pulse, temperature, bodily strength, and aspect, as well as of the urgency of any disease with which the diarrhœa may be associated, such as nephritis, phthisis or typhoid fever. The practitioner must not be influenced too much by theoretical considerations or fail to take early and full advantage of the invaluable effect of opium in enteritis.

Clinical Indications.—The most striking symptom of enteric catarrh is diarrhœa — so striking indeed that the disease is commonly known by this name, and the whole attention of the patient, possibly of the practitioner also, may be devoted to its arrest. Frequency and liquidity of stools are no doubt valuable guides to treatment: but of equal importance, although less appreciated and employed as indications, are their other characters: the presence of recognisable particles of food, of mucus, of blood; the reaction, the colour, the odour and appearances suggestive of fermentation; also the passage of flatus. There is not one of these characters that may not be turned to account by the careful practitioner in planning treatment, for instance in the intestinal catarrh of hand-fed infants. The ætiological and pathological conditions on which each of them depends will then call for attention as already discussed. The physical signs are of scarcely less value, particularly in children.

In addition to these local phenomena certain disorders of other parts, attended with distress and debility, call for direct relief. Prostration sometimes develops rapidly, with fall of body-temperature and a pinched cold appearance. These are the immediate results of loss of serous fluids, of the absorption of poisons instead of nutritive material from the bowel into the blood, and of the toxic action of these upon the system, particularly the circulation and the nervo-muscular structures. In addition to the indications for arresting the local disease in which they originate, these symptoms call urgently for bodily rest, warmth and the exhibition of restoratives in the form of nutritious food, water and stimulants. This brings us to the subject of diet in diarrhœa.

Diet is very properly regarded as the most important of all the measures employed in the treatment of intestinal catarrh. The correct management of it is a matter of much difficulty in practice. Whilst we fulfil the fundamental indication to support life and sustain strength by means of food in the face of an acute disease of a peculiarly exhausting description, we find ourselves compelled to give the bowel rest. At the same time the patient is devoid of all appetite. A compromise of some sort must be practised. At the very first, food must be reduced to a minimum, particularly in cases traced to excess or to luxurious living. Fluid nourishment only is ordered, in small quantities at a time, at short intervals, and neither quite hot nor quite cold, lest either extreme of temperature should provoke peristalsis. As a rule, milk is the best kind of food, being astringent as well as highly nutritious, whilst broths or meat essences aggravate the diarrhœa. But it must be carefully observed that neither milk nor any other particular kind of fluid food, however suitable it may appear *a priori*, is always admissible in enteric catarrh, because they all—individually in different instances—permit some pernicious fermentation or other to occur in them and indeed are favourite media of bacterial growth. Milk may be quite inadmissible, for example, in infantile diarrhœa, and broths have to become the sole diet for a few days, that is, until the milk-bred micro-organism has been thoroughly dealt with. Some kinds of diarrhœa, particularly of chronic type, are successfully treated with raw or under-done meat and water, a method which answers the two ends that are desired, namely, comparative rest of the bowel and good nutrition. In other instances the reverse plan is adopted: the subjects of diarrhœa from hepatic disorder, or from bad meat, taking milk and lime-water or milk and soda as their sole food for a few days. All meat preparations must be completely freed from fat. Farinaceous products, particularly genuine arrowroot, appear to have an almost specific action in checking diarrhœa in some instances; they may be made with water if milk disagree, or a pancreatised or peptonised combination of milk and farinas may be ordered. In arranging the diet for intestinal catarrh we must be careful also to forbid the use of certain articles. The most important

of these are: fats and oils in every form and combination; strong broths; fruit; vegetables, cooked and uncooked; eggs in excess; ices; all beers and ales; sweet fermented beverages, and indeed large draughts of every kind. Stimulants are usually called for in diarrhœa. In urgent cases they may be the means of saving life. In children and even in infants they must be employed—*pro rata*. Brandy is the best form of alcoholic stimulant in this disease. Port suits some patients. Other wines are best avoided. White wine whey is recommended for infants.

As the diarrhœa diminishes and passes off, return to ordinary diet may be cautiously commenced. Farinaceous thickenings, milk puddings made at first without eggs, bread and milk, carefully prepared tea (not hot) and plain toast will be allowed. Thereafter a small portion of the heart of a mutton chop or roast leg of mutton, without a trace of fat, may be eaten with stale bread, if the appetite should have returned. Vegetables and fats will probably be the last articles to be added.

Pain and bodily and mental depression or misery demand sedatives, of which opium is by far the best, answering at the same time other indications. The different forms in which it may be given have already been referred to and will be illustrated in the following Outline of Practice. The importance of rest has also been already discussed. As a rule the patient may safely be permitted to resume work in a very few days; but some time and care must be devoted to make good the loss of fluids and solids which the body sustains during a sharp attack of diarrhœa.

Outline of Practice.

I. Commencement of the Case.—*General Management.*—Rest in bed or indoors (p. 500). Warmth and support locally (p. 501).

Diet.—Necessity of diagnosis of cause and of nature of any fermentation or bacterial decomposition present, before ordering diet (p. 503). Importance of spare amount (p. 503). Unless definite reason to the contrary:—four or five fl. oz.

every three or four hours, of boiled or peptonised milk, at tepid temperature—(*a*) plain; (*b*) with an equal quantity of lime water; (*c*) with ♏xx-lx saccharated solution of lime B.P.; (*d*) with a little pure arrowroot, or an arrowroot biscuit; (*e*) with thoroughly-soaked or boiled bread; (*f*) if indicated, with 2 fl. drachms or more of brandy. As a variety, 4 or 5 fl. oz. of water arrowroot with 2 fl. drachms of brandy (p. 504). Other foods to be *avoided* (p. 504).

Medicines.—A selection of mild purgatives (p. 497): (1) ℞ Olei Ricini ♏xxx-℥ii-℥ss, Tincturæ Zingiberis ♏xxx, Ovi Vitelli ℥ii, Aquæ Cinnamomi ad ℥i. At once. (2) For a child—℞ Olei Ricini ♏v, Acaciæ Gummi gr. iiiss, Aquæ Menthæ Piperitæ ℥i. Four times a day, as required. (3) ℞ Rhei Radicis gr. x, Sacchari Albi gr. xxx, Olei Myristicæ ♏i. At once, in water. (4) ℞ Pulveris Rhei Compositi gr. xxx-lx. At once. (5) For a child—℞ Rhei Radicis gr. i-iii, Sodii Bicarbonatis gr. ii, Hydrargyri cum Creta gr. ss-i, Zingiberis gr. ss. At once. (6) In gouty enteritis—(*a*) ℞ Rhei Radicis gr. v, Ipecacuanhæ Radicis gr. ss, Magnesiæ Ponderosæ gr. v, Potassii Bicarbonatis gr. xv, Sodii Bicarbonatis gr. v, Ammonii Carbonatis gr. iv, Aquæ Menthæ Piperitæ ℥i. At first, three times a day, three hours after meals; then smaller doses and less frequently, according to result. (*b*) ℞ Hydrargyri Subchloridi gr. i. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. i.] At once. (*c*) ℞ Pilulæ Hydrargyri gr. v. [U.S.P. ℞ Massæ Hydrargyri gr. ii.] At bedtime, repeatedly. (*d*) ℞ Pilulæ Hydrargyri Subchloridi Compositæ gr. v. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. i, Antimonii Sulphurati gr. i, Guaiaci Resinæ gr. ii.] Every evening or every second evening for a week or more.—Alkaline intestinal astringents and sedatives (p. 499): (1) Lime Water; to be added to milk. (2) Saccharated Solution of Lime B.P.; to be added to milk. (3) ℞ Misturæ Cretæ ℥i. After every loose motion. (4) ℞ Pulveris Cretæ Aromatici gr. xl, Misturæ Amygdalæ ad ℥i. [U.S.P. ℞ Pulveris Aromatici gr. v, Pulveris Cretæ Compositi gr. xl, Emulsionis Amygdalæ ad ℥i.] After every loose motion. (5) In children—℞ Sodii Bicarbonatis gr. iii, Rhei Radicis gr. iss, Zingiberis Radicis gr. ss. To be used occasionally.—A variety of intestinal disinfectants (p. 499): (1) ℞ Liquoris Hydrargyri

Perchloridi ℥i, Aquæ ad ℥ss. [U.S.P. ℞ Hydrargyri Chloridi Corrosivi gr. $\frac{1}{2}$, Aquæ Destillatæ ℥iv.] Four or more times a day. (2) ℞ Olei Terebinthinæ ♏xv. In capsule, three times a day. (3) ℞ Olei Terebinthinæ ♏xv, Misturæ Amygdalæ ad ℥i. [U.S.P. ℞ Olei Terebinthinæ ♏xv, Emulsionis Amygdalæ ad ℥i.] Four times a day. (4) ℞ Beta-Naphthol gr. v. Three times a day. (5) ℞ Salol gr. x. Three times a day, in cachet.—Other astringent combinations (p. 501): (1) ℞ Bismuthi Subnitratis gr. xx-xl-lx. Given in a little milk or water, every four hours, as required. (2) ℞ Aluminis gr. xv, Magnesii Sulphatis gr. xx, Acidi Sulphurici Diluti ♏xv, Aquæ Destillatæ ad ℥i. As before. (3) Containing tannates (p. 501): (*a*) ℞ Pulveris Catechu Compositi gr. xv-xxx. [U.S.P. ℞ Pulveris Catechu gr. vi-xii, Pulveris Kino gr. iii-vi, Pulveris Krameriæ gr. iii-vi, Pulveris Cinnamomi gr. iss-iii, Pulveris Myristicæ gr. iss-iii.] As before. (*b*) ℞ Pulveris Kino Compositi gr. v-xx. [U.S.P. ℞ Pulveris Kino gr. iv-gr. xv, Pulveris Opii gr. $\frac{1}{4}$-gr.i, Pulveris Cinnamomi gr. i-gr. iv.] As before. (*c*) ℞ Tincturæ Catechu ♏xxx, Tincturæ Opii ♏v, Misturæ Cretæ ad ℥i. [U.S.P. Tincturæ Catechu Compositæ ℥i, Tincturæ Opii ♏v, Misturæ Cretæ ad ℥i.] As before.—Disinfectant and astringent: ℞ Bismuthi Salicylatis gr. xv. In milk or in cachet. Four times a day.

II. *Progress of the Case.*—(1) *If improvement.—General Management.*—Patient may move about and return to work presently. *Diet.*—Plain milk puddings (rice, tapioca, sago, etc.); blanc-mange. Meat "teas" thickened with tapioca and milk. Rice. Carefully prepared potato. Entirely lean underdone mutton. Boiled fish without butter. Gradual return to ordinary diet (p. 504). *Medicines.*—Mild gastro-intestinal sedatives: (1) ℞ Bismuthi Subnitratis gr. x. In a little milk three times a day. (2) ℞ Liquoris Bismuthi et Ammonii Citratis ℥i; Aquæ ad ℥ss. [U.S.P. ℞ Bismuthi et Ammonii Citratis gr. v, Aquæ Destillatæ ad ℥ss.] Three times a day.

(2) *If no improvement. General Management.*—Strict rest and warmth in bed. *Diet.*—Reconsider cause of enteritis, particularly inspecting the motions (p. 502). If found to be unwholesome milk, as in infants and children: carefully

prepared infusions of beef, veal, mutton, etc., given gently warmed, in small feeds every three hours or more often according to urgency of case. Brandy as before (or proportionate doses for infants or children).—Otherwise milk in different forms as at commencement.

Medicines.—Various combinations of opium as intestinal astringents (p. 501); ℞ Pulveris Ipecacuanhæ Compositi gr. v-xv. [U.S.P. ℞ Pulveris Ipecacuanhæ et Opii gr. v-xv.] Every four hours if required. (2) ℞ Pulveris Ipecacuanhæ Compositi gr. v-x, Bismuthi Subnitratis gr. xx. [U.S.P. ℞ Pulveris Ipecacuanhæ et Opii gr. v-x, Bismuthi Subnitratis gr. xx.] As before. (3) ℞ Pulveris Cretæ Aromatici cum Opio gr. x-xl. As before. (4) ℞ Tincturæ Opii ♏xv, Tincturæ Catechu ʒi, Misturæ Cretæ ad ℥i. [U.S.P. ℞ Tincturæ Opii ♏xii, Tincturæ Catechu Compositæ ʒii, Misturæ Cretæ ad ℥i.] As before. (5) ℞ Tincturæ Opii ♏xx-♏xxx, Mucilaginis Amyli ℥ii. [U.S.P. ℞ Tincturæ Opii ♏xv-xxv, Mucilaginis Amyli ℥ii.] Given as an enema, as before. (6) ℞ Tincturæ Opii ♏x, Acidi Sulphurici Diluti ♏xv, Spiritus Chloroformi ♏xx, Aquæ Cinnamomi ad ʒi. As before. (7) ℞ Tincturæ Chloroformi et Morphinæ Compositæ ♏x, Aquæ ad ℥i. [U.S.P. ℞ Chloroformi ♏$\frac{3}{4}$, Morphinæ Hydrochloratis gr. $\frac{1}{10}$, Acidi Hydrocyanici Diluti ♏$\frac{1}{2}$, Tincturæ Capsici ♏$\frac{1}{4}$, Tincturæ Cannabis Indicæ ♏i, Olei Menthæ Peperitæ ♏$\frac{1}{10}$, Glycerini, ♏ii, Alcohol ♏v, Aquæ ad ℥i.] As before. (8) ℞ Liquoris Morphinæ Acetatis ♏xx-♏xl, Plumbi Acetatis gr. ii, Acidi Acetici Diluti ♏xx, Aquæ ad ℥i. [U.S.P. ℞ Morphinæ Acetatis gr. $\frac{1}{5}$-$\frac{2}{5}$, Plumbi Acetatis gr. ii, Acidi Acetici Diluti ♏xx, Aquæ Destillatæ ad ℥i.] As before. (9) ℞ Pilulæ Plumbi cum Opio gr. iv. As before. (10) Habeat Suppositorium Plumbi Compositum i. [U.S.P. ℞ Pulveris Opii gr. i, Plumbi Acetatis gr. iii, Olei Theobromatis gr. xv.] As before.

Raw Meat diet in different forms, to be used in some instances of severe intestinal catarrh (p. 503)—(1) Sandwiches of scraped meat pulp, as such or with a little salt or sugar.[1] (2) Raw meat balls—scraped meat mixed with cream

[1] Burnet, "Foods and Dietaries," p. 37; W. S. Fenwick "Disorders of Digestion," p. 366.

and rolled rapidly over a very hot baking tin.[1] (3) Trousseau's *conserve de Damas*.[2] (4) Meat pulp (obtained by scraping and passing the pulp through a coarse sieve) used as thickening of beef tea.[3] (5) Raw meat soup.[4]

[1] Mrs. Ernest Hart, "Diet in Sickness and in Health," p. 115.

[2] "Clinique médicale," tome iii. p. 126.

[3] Burnet, "Foods and Dietaries," p. 37; W. S. Fenwick, "Disorders of Digestion," p. 366.

[4] Weir Mitchell, quoted by Burney Yeo, "Food in Health and Disease," p. 503.

CHAPTER XXV.

CONSTIPATION.

Constipation might appear from the therapeutical point of view to be too simple a subject for notice here. It is, however, a peculiarly instructive one for the young practitioner to study in connexion with his attempts to grasp and employ the principles of rational treatment. In the first place, it teaches him to discover and respect causes before employing remedies; and amongst causes he will have an opportunity to appreciate and deal with such obscure, complex and obstinate influences as disturbances of habit and the neglect of periodic visceral activity. He will also learn once more the value of exercise as a means of training involuntary muscles as well as voluntary muscles to regain their functional activity and capacity. Besides these lessons, constipation affords him an excellent opportunity of reviewing some of the principles of dieting, particularly the selection of food for the sake of securing certain of the actions which it possesses other than that of simple nutrition.

Ætiological Indications.—Broadly speaking, there are three great classes of causes of abnormal retention of fæces within the bowel. The first of these classes might be called faults of the intestines and associated parts; the second class faults of the ingesta, particularly errors of diet; the third, faults of habit. In endeavouring to attend to the primary ætiological indication, removal or avoidance of the cause, it is not always possible to diagnose to which class it belongs. Very often several causes are combined, or the causation is complex, faults of one class promoting the supervention of others. Again, it

is not always easy or indeed possible to deal with the causes when they have been discovered. Errors of diet and careless habits may be corrected; but certain defects and diseases of the bowels, even of a functional kind, are beyond remedy.

Structural disease involving the bowel, mechanically and otherwise a cause of faecal retention, demands direct attention. The constipation produced by this gravest of all causes usually receives exaggerated treatment, for instance in intestinal obstruction: it is of insignificant concern compared with other effects of the disease. In some cases belonging to this group, however, removal of the cause is a simple affair, such as replacement of a retroverted gravid uterus or the clearance of a faecal mass impacted in the rectum.

Atony of the muscular coat of the intestine is believed to be a common intrinsic cause of constipation. The muscular weakness is in many instances more correctly torpidity or nervo-muscular lethargy or languor begotten of neglect, that is of abuse of rest of the bowel by wilful inattention to natural promptings and sedentary life. This type of constipation is most common in women. The indication for treatment here is to exercise the bowel, with a view to train or educate it to discharge its functions regularly. The object and the test of success is to secure every day a single, punctual, sufficient action, which at the same time shall not interfere with the appearance of an equally sufficient evacuation on the following morning, but on the contrary favour it. This end is accomplished by adopting a rational method of stimulation of the intestinal wall, just as well-planned stomachic measures are so successful in chronic dyspepsia. In the words of Andrew Clark we have first to insure on the part of the patient "regular solicitation, patience, and contentment with moderate result."[1] Torpidity of the body as a whole must be met by regular exercise in the fresh air. As a rule the diet has to be temporarily modified so as to include foods that are naturally laxative and to exclude foods that are naturally astringent. We shall return to this subject presently.

Reforms in these different and diverse directions may suffice to restore the interrupted or irregular action of the

[1] Sir Andrew Clark, *Brit. Med. Journ.*, London, 1887, vol. ii. 1106.

bowels, if perseveringly carried out. As a rule, however, they have to be reinforced with medicinal agents, belonging to the class of simple purgatives, laxatives or aperients. The most suitable of these is aloes, commonly given in pill, as such, as the extract or as aloin, according to a multitude of different formulæ, simple or complex, to suit different combinations of indications, including stomachic, hæmatinic, tonic and cholagogue treatment. The idea is to secure a single ordinary evacuation, a soft but formed motion, once a day, and usually in the morning after breakfast. Less than this would not be satisfactory; more than this, that is, one or more loose motions, would not answer our purpose, as complete emptying of the bowel would leave nothing behind to promote distension and stimulation of the bowel next day. The dose of the aperient must therefore be modified until, as far as is ever possible, the suitable amount is discovered. Besides aloes, there are other useful laxatives, such as cascara and senna, which may be given in a variety of forms, selected according to circumstances. Saline aperients are not suitable for atony of the bowel, neither is rhubarb, although both are habitually taken by some costive people. Whichever drug is chosen, if it be used with success, the dose may be gradually reduced, until it is found that the intestine has been trained to discharge its function with regularity, has recovered its tone, and may be safely left to itself. Atony of the bowel in other instances appears to consist in an essential or inherent weakness of the muscular or nervo-muscular structures of the bowels, which may be inherited. There are certainly instances of family costiveness which cannot be successfully controlled except by the habitual use of laxative medicines. Whilst the various measures just reviewed must also be employed in these persons, there will be little prospect of our effecting the education of the bowel which is often successfully accomplished in the previous class of patients; and an artificial stimulus must be continued indefinitely.

Disturbances of the blood and circulation in the intestinal wall constitute another common cause of constipation which demands removal. Cases of this kind are also described as pelvic congestion or abdominal plethora, and they are

often characterised in women (the most frequent sufferers) by menstrual irregularities, uterine disorders and anæmia.[1] From defect in its quantity, quality or rate of movement, the blood supplied to the bowel is insufficient, and the result is nervous, muscular and glandular inertia. The class of purgatives indicated in these instances are saline aperients, alone or combined with iron or with rhubarb. They are usually ordered as a single draught in the early morning, a hæmatinic or other tonic being given during the day, or an aloes and iron pill at bedtime. The chief object is to drain the abdominal veins sufficiently to relieve and finally overcome passive congestion within them; and it is believed that a single loose motion in the early part of the day accomplishes this, with the assistance of the iron. Certain natural mineral waters are recommended on the same principle, such as those of Pullna, Friedrichshall, Hunyadi Janos and Seidlitz on the continent of Europe, and the Saratoga, Crab Orchard, Bedford and Estrill springs in the United States.

Defective action of the glands connected with the bowel, including the liver and pancreas, is often a cause of constipation which requires direct attention. The secretions which flow into the intestine are specific stimulants of peristalsis, and the simple addition of them in normal amount to the contents of the bowel must reduce the consistence of the fæces and promote their transmission downwards. Biliary disorders in particular are recognised as calling for removal in many cases of constipation; and arrest of the secretions in the constipation of fever indicates stimulation.[2] We are here introduced to the use of some of our most familiar purgatives, including mercurials in different forms, podophyllin, euonymin, sodium sulphate and phosphate, and magnesium sulphate: of other alkaline salts, such as sodium bicarbonate, which stimulate both liver and bowels, after previous action on the stomach; and of many of the best natural mineral waters, which contain alkaline salines in a variety of combinations, such as those of Homburg, Carlsbad, Ems, Harrogate, and Marienbad in the Old World and the Champion, Congress and Saratoga Springs

[1] Clark, *loc. cit.*

[2] F. Taylor, "Practice of Medicine," 5th Edition, p. 639.

in the New. The whole effect of saline aperients is of course not accounted for by their action on the liver and intestinal glands, but in the present connexion this part of it may be emphasised. These remedies are usually ordered in the form of single sharp purges, often following up an aperient pill, or of short courses of aperient waters at a spa.

The nervous mechanism of the bowel and defæcation will have to be corrected when found disordered. Constipation of a very severe type necessarily accompanies paralysis of the intestine in diseases of the spinal cord and other parts of the central nervous system; and must then be treated accordingly. Under this head we may also refer to the costiveness which depends on neglect of the natural prompting to evacuate the bowels. As we have already seen, inattention or indifference is often accountable for this. In other instances it is an unfortunate modesty which interferes with regularity of habits, the importance of which will be presently discussed, as well as the measures calculated to effect a cure.

We have thus disposed of most of the types of constipation which can be readily referred to defects in the intestine itself and associated parts. We have next to consider how errors connected with the food and other ingesta cause the disorder, and are to be dealt with as such.

Constipation can often be traced to errors of diet which must be remedied; and, as we have already seen, attention to diet is of essential importance in all types of insufficient action of the bowels. Food may be found to be insufficient in bulk by the time it reaches the lower bowel, whether by being actually taken very sparingly, or because it has been so freed from indigestible constituents in the process of selection or cooking or possibly pre-digestion that there is little or no residue to evoke peristalsis. The introduction of a commoner diet, including whole-meal bread, oat-meal porridge, green vegetables and fruit, a considerable percentage of which passes through the stomach and bowel quite undigested, is a rational and very usual method of meeting the difficulty in these instances. Foods that are naturally astringent may have to be removed from the diet of costive individuals, and foods that are naturally laxative added. Milk is the most constipating

of all foods in general use. Strong tea, red wines, brandy and hard water all have the same effect. On the contrary, meat if well hung, game—particularly if at all "high," fats and oils, most fruits and green vegetables, draughts of hot water or of such beverages as weak tea and coffee, and (with some persons at least) malt liquors are either laxative in their action or at least not astringent. A careful selection of these should therefore be made when we are planning the diet in every case of constipation, whether referable to error in diet or no. In this connexion also it is necessary to remember that some drugs in common use for their other effects are highly astringent and may be accountable for constipation, such as opium, lead and lime.

Closely allied to the diet in its relations to intestinal activity are the ingestion and excretion of water. It is not surprising that persons who habitually drink nothing with their solid meals but a glass of red wine should suffer from constipation. A glass of water towards the end of luncheon and dinner, and a full glass either of hot or of plain cold water at bedtime and on waking, are clearly indicated in such cases. It is not suggested that the water thus freely taken passes directly downwards and *per se* moistens the faeces; but the free consumption of water must indirectly increase the amount eliminated, and is calculated to add to the secretions from the intestinal glands which mainly determine the consistence of the motions and lubricate the passages. The same effect is produced by rapid transit of the faeces, whilst delay from any of the causes which we have examined aggravates constipation by permitting inspissation by absorption. In other words, to secure a daily evacuation is to overcome constipation in two ways, directly and indirectly.

Lastly, faulty digestion is a very common accompaniment of constipation, and may sometimes be in part a cause of it. Necessarily the stomach is regarded in every measure planned and ordered from disorder of the intestine in respect of food, physic and other means.

Whilst most cases of constipation can be traced to faults of the bowel or to errors of diet, or to both, and are rationally treated from these points of view, there is a third series

of causes which must also be reckoned with in this complaint. These, as we have said, are connected with disturbances of the periodicity of the function of intestinal evacuation. Food and drink may be well selected and consumed in proper form and proportion, and the different parts of the intestinal apparatus may work well both individually and collectively —the muscles, nerves, vessels and blood, liver, pancreas and intrinsic glands; and yet constipation may occur from wilful, careless or unavoidable interference with the habit of regular daily defæcation which had been formed by careful training during childhood on the basis of periodic accumulation and discharge. Persons even of adult age are occasionally met with who have entirely lost this habit and are entirely ignorant of its importance. These must be instructed. Other subjects of constipation frankly confess that they have understood but ignored this elementary item of personal hygiene. These must be admonished. In a third and larger set of cases the habit is respected but cannot be practised for want of convenience or opportunity. These cases are met with in young women for whom no special provision has been made in the domestic arrangements; in persons travelling; and in visitors at hotels or even private houses. It is probably this interference with habit that accounts in great measure for the frequency with which constipation is attributed to change of climate, the weather, the sea-side or the Continent, though other factors doubtless contribute in different instances. These considerations are thoroughly practical in their bearing on treatment. The subjects of constipation from this cause must be assisted. Mothers must come to their daughters' help in this respect; and it is surprising how often the practitioner must insist on this being done. When a habitual aperient pill is prescribed for these patients, we are careful to impress upon them the effect which it is intended to produce, namely restoration of the lost habit of periodic movement of the bowels. Patients who have systematically neglected this important function may have to be instructed repeatedly on the subject. We tell them that it is not a motion that we desire to obtain as the effect of the pill, but a call to stool at a particular and pre-arranged hour; and that they must respect and

encourage this by punctiliously following a well-planned daily rule.

Pathological Indications.—Beyond the pathological characters of the diseases on which in some instances it depends, there are certain structural changes directly connected with unnatural retention of the contents of the bowels which occur occasionally and may require attention. Thus if intestinal dilatation from insufficient emptying (residual dilatation) be established in chronic constipation, it is an indication, according to the principles laid down in Part I., p. 103, for diminution of the resistance ahead, removal of the arrears and backward pressure behind the block, and increase of the force of the nervo-muscular walls. These objects are usually fulfilled collectively by the employment at intervals of purgatives of an active class, the cathartics, such as colocynth, podophyllin, scammony and jalap, which are best given in the form of pill, combined with other purgatives and carminatives as required; and it is well to follow up these with a brisk saline draught to complete evacuation promptly. In other instances purgative enemata are given with advantage to relieve the over-distended organ. Of these there is great variety—simple, medicated, lubricant, etc., acting by the volume of fluid, by its solvent or emulsifying effect on the fæces, by the force of its impact, or by its specific influence on the wall of the bowel, such as castor oil, turpentine, Epsom salt, aloes, asafetida, soap, and glycerin. A third method of dealing with dilatation and impaction of the bowel, and a thoroughly rational one, is massage, systematically practised for weeks on end, just before the hour of habitual evacuation. When the rectum is impacted it may have to be cleared with the finger or a spoon. Hypertrophy of the gut is found in association with chronic constipation and dilatation, and is to be regarded as a purely conservative process in itself, although an evidence and a measure of disorder. It is therefore to be encouraged according to general principles; and it is further of interest to the practitioner as suggesting the necessity for increased nervo-muscular activity of the bowel, of course along with removal of the cause of the difficulty if possible. A third pathological condition found associated with constipation is intestinal catarrh. This is a result of the

irritant residues or scybala, and suggests as well as requires purgatives. Enemata or the simpler purgatives are best employed under these circumstances—castor oil, rhubarb, senna, a combination of magnesium carbonate and sulphate, blue pill and the like.

Clinical Indications.—The clinical phenomena of constipation are unsafe and insufficient guides to treatment unless their significance be first carefully determined in each instance. Regarded as a whole, that is, as a concrete disorder worthy of separate recognition and attention, its causes must be diagnosed before relief is attempted. It may be due to hernia, or to cerebral tumour, or to lead poisoning, or to anæmia; to neglect of function, to improper diet. How irrational and how unsuccessful would be the routine treatment of constipation without further investigation, or even an attempt to formulate a line of treatment for it as an independent affection! Regarded, in the second place, as a simple intestinal derangement, apart from its cause, constipation might seem at first sight to afford therapeutical indications of the most obvious and most elementary kind. The infrequent and irregular appearance of motions and their dry hard character plainly suggest aperient measures. A little reflection shows us that this is a very incomplete view. The laity attach exaggerated importance to constipation and the use of purgatives, as is proved by the enormous consumption of this class of proprietary medicines; but even the laity understand that there is much more in this complaint than infrequency and costiveness of the motions. Correctly defined, constipation does not consist in morbid infrequency of the bowels, but in insufficient evacuation and consequent retention of fæces. It is not the unhealthy motion passed that treatment has to reach, though this may have caused certain discomforts during defæcation: it is the unhealthy fæces still retained. Besides the humble function of evacuating the waste products constituting the fæces, the intestine carries on three functions of a higher order: digestion, absorption and excretion, of which the uninstructed are ignorant, but the derangements of which, in the form of headaches, debility and an unhealthy colour, they appreciate. The intestine is indeed part of the

primæ viæ of the body, where nutrition and sanguification begin. We may say, therefore, that there are three ways in which fæcal retention disturbs the blood and the system generally, and which the practitioner has to regard very carefully in planning treatment. It deranges intestinal digestion, giving rise to discomfort, depression and the other phenomena of dyspepsia. It deranges absorption, and that in two ways; for whilst torpidity of the bowel is attended with reduced activity of lacteal and vascular absorption in the villi, the products of disturbed digestion and fæcal decomposition pass into the blood, liver, and other organs beyond, constituting a process of self-poisoning. Thirdly, it interferes with the excretion of intrinsic poisons, that is, it permits the retention in the system of highly deleterious effete products. The symptoms of these three different classes of functional disturbance caused by fæcal retention are chiefly headache, heaviness, languor, confused useless feelings in the head, depression, weakness, foul tongue and breath, and anæmia and its endless consequences. Andrew Clark maintained that chlorosis originated in constipation and could be remedied by means of aperients. It is of the first importance that the practitioner should appreciate these clinical relations of constipation, not only in order that he may attach due importance to the treatment of the disorder, but also lest he should be tempted to treat what are but its symptoms, particularly anæmia, as substantive or primary affections instead of through the bowel. In other words, these phenomena have to be referred to the pathological condition of which they are significant, and it, not they, must then be attacked. This is done by following the ætiological guides already fully discussed.

Outline of Practice

Diagnosis essential of the pathological condition of which constipation is symptomatic. In constipation of functional origin in adults proceed to order treatment as follows:—

General Management.—Exercise (p. 510) or massage (p. 516). Cultivation of and attention to habit (p. 515). *Diet.*—(1) To be specially *taken* (*caution:* first determine absence

of structural disease, p. 510): A sufficient bulk of food (p. 513). Abundance of water, cold or hot, as such or in form of beverages with or at the end of the different meals, in the early morning, and at bedtime (p. 514). Brown or whole-meal bread. Oat-meal or whole wheat-meal porridge with cream or syrup. Fat and oils in great variety, particularly fat of meat, bacon, fat of ham, butter, dressed salads, cream, yolk of egg, suet puddings with syrup. Vegetables, green and root. Fruits, fresh and cooked. Wholesome ales and cider. (2) To be specially *avoided:* strong tea; milk; red wines; certain natural waters. Very white forms of bread.

Medicines:—A selection of *aperients for habitual use* (p. 511).—(1) ℞ Extracti Belladonnæ Alcoholici gr. $\frac{1}{8}$, Extracti Nucis Vomicæ gr. $\frac{1}{8}$, Myrrhæ gr. $\frac{1}{2}$, Ferri Sulphatis gr. i, Extracti Aloes Barbadensis gr. i, Extracti Gentianæ q.s. Every evening. (2) ℞ Aloini gr. $\frac{1}{4}$, Ferri Sulphatis Exsiccati gr. $\frac{1}{2}$, Extracti Cascaræ Sagradæ gr. $\frac{1}{2}$, Olei Menthæ Piperitæ ♏ i. Every evening. (3) ℞ Pulveris Glycyrrhizæ Compositi ʒi. Every evening. (4) ℞ Confectionis Sennæ ʒi. Every evening. (5) ℞ Extracti Cascaræ Sagradæ Liquidi ♏ xxx, Extracti Glycyrrhizæ Liquidi ♏ xxx, Glycerini ♏ xxx, Tincturæ Cardamomi Compositæ ♏ xx, Tincturæ Belladonnæ ♏ v, Aquæ Chloroformi ad ʒi. [U.S.P. ℞ Extracti Rhamni Purshianæ Fluidi, ♏ xxx, Extracti Glycyrrhizae Fluidi ♏ xxx, Glycerini ♏ xxx, Tincturæ Cardamomi Compositæ ♏ xx, Tincturæ Belladonnæ Foliorum ♏ v, Aquæ Chloroformi ʒiv, Aquæ Destillatæ ad ʒi.] Every evening.

Various cholagogue purgatives (p. 512):—(1) ℞ Pilulæ Hydrargyri gr. v. [U.S.P. ℞ Massæ Hydrargyri gr. v.] At bedtime. (2) ℞ Pilulæ Hydrargyri gr. iii, Pilulæ Rhei Compositæ gr. ii. [U.S.P. ℞ Massæ Hydrargyri gr. iii, Pulveris Rhei gr. $\frac{1}{2}$, Aloes Socotrinæ gr. $\frac{1}{3}$, Myrrhæ gr. $\frac{1}{3}$, Saponis gr. $\frac{1}{3}$, Olei Menthæ Piperitæ ♏ $\frac{1}{3}$.] At bedtime. (3) ℞ Hydrargyri Subchloridi gr. ii, Sacchari Albi gr. ii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. ii, Sacchari gr. ii.] At bedtime. (4) ℞ Hydrargyri Subchloridi gr. i, Pilulæ Colocynthidis et Hyoscyami gr. iv. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. i, Extracti Colocynthidis Compositi gr. iii, Extracti Hyoscyami gr. i.] At bedtime. (5) ℞ Hydrargyri Subchloridi gr. $\frac{1}{2}$, Podophylli Resinæ gr. $\frac{1}{4}$, Ipecacuanhæ Radicis gr. $\frac{1}{2}$, Pilulæ

Colocynthidis et Hyoscyami gr. iii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. ½, Resinæ Podophylli gr. ¼, Pulveris Ipecacuanhæ gr. ½, Extracti Colocynthidis Compositi gr. ii, Extracti Hyoscyami gr. i.] At bedtime. (6) ℞ Extracti Euonymi Sicci gr. i, Aloini gr. ¼, Extracti Belladonnæ Viridis gr. ¼. [U.S.P. ℞ Extracti Euonymi gr. i, Aloini gr. ¼, Extracti Belladonnæ Foliorum Alcoholici gr. ¼.] At bedtime.

A selection of *saline purgatives* (p. 512):—(1) ℞ Sodii Sulphatis Effervescentis B.P. gr. 120-240, Aquæ ℥v. In the early morning. (2) ℞ Sodii Phosphatis Effervescentis B.P. gr. 120-240, Aquæ ℥v. In the early morning. (3) ℞ Magnesii Sulphatis Effervescentis B.P. gr. 240-480, Aquæ ℥v. In the early morning. (4) Habeat Pulverem Sodæ Tartaratæ Effervescentem B.P. In the early morning. (5) ℞ Magnesiæ Ponderosæ gr. xxx, Rhei Radicis gr. xv, Spiritus Ammoniæ Aromatici ♏xxx, Aquæ Pimentæ ad ℥ii. In the early morning. (6) ℞ Magnesii Sulphatis gr. lx, Magnesii Carbonatis Ponderosi gr. xv, Misturæ Amygdalæ ℥i. [U.S.P. ℞ Magnesii Carbonatis gr. xv, Emulsionis Amygdalæ ℥i.] In the early morning.

Cathartic combinations (p. 516): (1) ℞ Pilulæ Colocynthidis Compositæ gr. iv.-viii. [U.S.P. ℞ Extracti Colocynthidis Compositi gr. iv-viii.] At bedtime. (2) ℞ Podophylli Resinæ gr. ½, Extracti Cannabis Indicæ gr. ¼, Extracti Hyoscyami Viridis gr. iv. [U.S.P. ℞ Resinæ Podophylli gr. ½, Extracti Cannabis Indicæ gr. ¼, Extracti Hyoscyami gr. iii.] At bedtime. (3) ℞ Pilulæ Scammonii Compositæ gr. v. [U.S.P. ℞ Resinæ Scammonii gr. ii, Resinæ Jalapæ gr. iss, Saponis gr. iss, Oleoresinæ Zingiberis ♏ ½.] At bedtime. (4) ℞ Pulveris Jalapæ Compositi gr. xxx-lx. In the early morning.

Purgative enemata (p. 516): (1) ℞ Saponis Mollis ℥i, Aquæ tepidæ Oiss. (2) ℞ Magnesii Sulphatis ℥i, Olei Olivæ ℥i, Mucilaginis Amyli ℥xv. (3) ℞ Olei Olivæ ℥ii, Mucilaginis Amyli ℥i, Decocti Hordei tepidi ℥x. (4) ℞ Olei Ricini ℥ii, Unius Ovi Vitellum, Decocti Hordei tepidi ad Oss. (5) ℞ Olei Terebinthinæ ℥i, Mucilaginis Amyli ℥xv. (6) ℞ Olei Terebinthinæ ℥ss, Unius Ovi Vitellum, Saponis Mollis ℥i, Aquæ tepidæ ad Oiss. (7) ℞ Asafetidæ gr. xxx, Aquæ Destillatæ ℥iv. (8) ℞ Glycerini ℥i. (or the same in the form of suppository).

Aperient iron combinations (p. 511): (1) ℞ Pilulæ Aloes et Ferri gr. iv.-viii. [U.S.P. ℞ Pilulæ Aloes et Ferri gr. v.] Every evening. (2) ℞ Aloini gr. ½-1, Extracti Belladonnæ Viridis gr. ¼, Extracti Nucis Vomicæ gr. ⅛, Ferri Sulphatis gr. i, Extracti Gentianæ q. s. [U.S.P. ℞ Aloini gr. ½-i, Extracti Belladonnæ Foliorum Alcoholici gr. ¼, Extracti Nucis Vomicæ gr. ⅛, Ferri Sulphatis gr. i, Extracti Gentianæ q. s.] Every evening. (3) ℞ Ferri Sulphatis Exsiccati gr. ½, Extracti Aloes Barbadenses gr. i, Extracti Belladonnæ gr. ⅙, Ipecacuanhæ Radicis gr. ½, Capsici Fructus gr. ⅙. [U.S.P. ℞ Ferri Sulphatis Exsiccati gr. ½, Extracti Aloes gr. i, Extracti Belladonnæ Foliorum Alcoholici gr. ⅙, Pulveris Ipecacuanhæ gr. ½, Pulveris Capsici gr. ⅙.] Every evening. (4) ℞ Ferri Sulphatis gr. iv, Magnesii Sulphatis gr. lx, Acidi Sulphurici Aromatici ♏x, Tincturæ Zingiberis ♏xx, Infusi Gentianæ Compositi B.P. ad ℥i. Twice a day, at 11 A.M and 6 P.M. (5) ℞ Ferri Sulphatis gr. iv, Sodii Bicarbonatis gr. xx, Sodii Sulphatis gr. lx, Tincturæ Zingiberis ♏xx, Spiritus Chloroformi ♏x, Infusi Quassiæ B.P. ad ℥i. At 11 A.M. and 6 P.M. daily. (6) ℞ Magnesii Sulphatis gr. lx, Liquoris Ferri Perchloridi ♏xv, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Magnesii Sulphatis gr. xl, Liquoris Ferri Chloridi ♏ii, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Every morning early. (7) ℞ Misturæ Ferri Compositæ ℥ss, Decocti Aloes Compositi B.P. ℥ss. At bedtime.

Aperient and stomachic combinations (p. 511) (1): ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏x, Tincturæ Sennæ Compositæ ♏xv-xxx, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day, 5 minutes before meals. (2) ℞ Tincturæ Nucis Vomicæ ♏v, Tincturæ Sennæ Compositæ ♏xv-xxx, Ammonii Carbonatis gr. iii, Spiritus Chloroformi ♏x, Infusi Quassiæ B.P. ad ℥i. Three times a day, five minutes before meals. (3) ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏x, Decocti Aloes Compositi B.P. ℥ss, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day, five minutes before meals. (4) ℞ Rhei Radicis gr. v, Ipecacuanhæ Radicis gr. ¼, Magnesii Carbonatis Ponderosi gr. vi, Sodii Bicarbonatis gr. v, Potassii Bicarbonatis gr. xv, Ammonii Carbonatis gr. iii, Aquæ Menthæ Piperitæ ℥i. Three times a day, three hours after meals.

CHAPTER XXVI.

APPENDICITIS—PERITYPHLITIS.

Perityphlitis is a complex and variable disease in its origin, in its course, and in its terminations. It is indeed not a single simple disease *ab initio*, like gastric ulcer or typhoid fever, with characteristic pathological and clinical manifestations, but the outcome of a variety of different diseases of the appendix vermiformis and cæcum. Some of the diseases may run their course without invading the local peritoneum, such as stercoral typhlitis and certain instances of catarrh and even of concretion of the appendix. In other instances perityphlitis consists in simple adhesive peritonitis. In typical, fully developed cases, it originates in severe appendicitis and the passage of micro-organisms through the wall of the gut into the peritoneal cavity, and it ends in suppuration there, whether with or without perforation or sloughing. The treatment of perityphlitis is correspondingly difficult. Even when the diagnosis is correctly made (not by any means an easy matter in many instances) the pathological indications and those furnished by the course of the disease are complex, variable and often uncertain; whilst grave changes may occur suddenly and without warning, particularly in the way of sloughing or perforation of the appendix and burrowing or bursting of pus in the peritoneal cavity.

The disease is therefore one which is not only full of practical interest but also highly instructive to the student of the principles of treatment. He will find in perityphlitis one of the best instances both of the strength and the weakness of natural resistance. He will appreciate presently how micro-organisms constantly in the neighbourhood of a part

may be unable to attack it because of its inherent immunity; how in one particular portion of an organ, like the appendix, this natural resistance is prone to lapse, in consequence of its peculiar anatomical structure and relations (predisposition); and yet how under these circumstances attention on the part of the therapeutist to various simple-looking circumstances may enable it to withstand disease. He cannot fail also to be impressed with the weak non-resistant character of the tissues of repair, and with the effect of this in permitting recrudescence. As for direct remedial measures, an excellent instance is afforded by appendicitis of the correct employment of food under circumstances where there is much less necessity to secure nutrition than to avert imminent and grave danger by withholding it. The deceptive effect of the routine employment of purely palliative treatment is also very strikingly illustrated in this disease.

Ætiological Indications.—A correct appreciation of the ætiological relations of appendicitis is of more than ordinary importance in treatment, for the disease is essentially recurrent, and as soon as one attack is safely passed without operation, the opportunity offers, and must be always faithfully taken, of preventing another or even radically removing the possibility of return.

Of the causes of this disease the most important, most interesting and the first to be examined are the predisposing circumstances. A portion of the bowel, the appendix vermiformis, is "liable" to acute disease, vulnerable, less resistant to certain morbific influences than the other parts, because of its peculiar anatomical and physiological relations (p. 6). It is so in all subjects; and we must take the risk of its becoming affected, unless we are prepared to remove the healthy appendix in every child as a routine practice! Certain individuals, however, appear to be specially predisposed, in consequence of the unfortunate situation, shape or size of the appendix in them. Even for these nothing special could well be done, inasmuch as their condition and danger cannot be diagnosed until an attack occur. Neither can the fact that appendicitis is more common in early life and in male subjects be turned to useful account in the way of prevention. Of all

the predisposing circumstances, the only one of real prophylactic value is previous disease of the same kind. It is not that appendicitis is simply recurrent, as gout, for example, recurs in the great toe: it is that the damage done to the appendix by one attack and its repair with ill-nourished low scar-tissue make it unable to resist disturbing influences of apparently trifling severity another time, such as a hearty meal or a passing chill. We have here an unusually plain indication for preventive treatment. The appendix ought to be removed after one or more attacks of perityphlitis.

Short of operation, prevention would have to be directed to the exciting or determining causes of appendicitis; and this is what is done in a large number of instances, at any rate after a single attack. On recovering from his illness, the patient is directed to attend to certain particulars which are recognised as of ætiological importance. He must eat with special care. Diet must exclude as far as possible such substances as are entirely indigestible and never digested: seeds and skins of fruit, whether fresh, cooked or preserved, coarse green vegetables, and whole-meal bread—things which are often thoughtlessly recommended to insure a daily motion. Milk ought to be sparingly taken and specially prepared, lest undigested curds reach the cæcum. There is abundant choice of *menu* in all classes of foods, after excluding those mentioned and others which are indigestible in the broader sense, without sacrificing any of the elements of a proper diet. Equally important is it that meals should be small, and slowly, not hurriedly, eaten, and that thorough mastication be also insured by attention to the state of the teeth. In connexion with the food and feeding as a whole the gouty causation of some cases of the disease will be reckoned with. The subject of a previous appendicitis must next be instructed to attend faithfully to his bowels. A regular daily motion must be insured, and this also will be considered in planning the diet, as we have just seen. If ordinary laxatives fail, enemata may have to be used. An occasional mercurial followed by a saline is indicated in gouty subjects. Special directions have always to be given as to clothing. The feet and lower limbs ought to be carefully protected from cold; the body generally kept comfortably warm,

and a woollen binder or belt constantly worn on the abdomen, sufficiently close to exercise a certain amount of support or even pressure on the right iliac fossa, in the hope of promoting absorption of the inflammatory residues about the bowel. Lastly, sudden and severe exertion must also be forbidden.

These are the principal circumstances recognised as determining singly or collectively an attack of appendicitis; and each of them ought to be specifically referred to in giving advice to patients on the subject of prevention. Unless they be controlled, they will afford an opportunity for the efficient causes of septic appendicitis and perityphlitis to come into play. This introduces to our consideration the causal relation of micro-organisms to the worst type of the disease. Micro-organisms of whatever kind, unless it be the tubercle bacillus and actinomyces, which settle there and steadily sap the nutrition of the parts, are innocuous to the bowel as long as they occupy its interior, some of them belonging to its natural flora. Let however the normal resistance of the intestinal wall be seriously reduced by any of the circumstances just named, and these micro-organisms become the efficient and active causes of disease in different forms. They and their toxic products readily cause necrosis of the appendix, penetrate its several coats including the peritoneum, and having reached a situation peculiarly favourable to development, establish acute peritonitis. The principle on which this catastrophe is to be averted is manifestly therefore the maintenance of normal resistance, that is, healthy nutrition, of the wall of the appendix. How this is to be done we shall see presently in connexion with the Pathological Indications.

Pathological Indications.—The pathology of appendicitis and perityphlitis is peculiarly complex, the beginning, the course and the termination of the process being extremely variable. Broadly speaking, we may say that there are two steps or stages in the disease, namely, first, appendicitis proper, beyond which in the majority of cases it does not proceed; second, septic peritonitis. In order to appreciate the objects of treatment we must study these stages separately.

Appendicitis proper consists in catarrh of the mucous membrane, infiltration of the wall, and plastic peritonitis of

its covering and neighbourhood, all set up by one or more of the causes already discussed. The products of the inflammatory process, as in other forms of enteritis, are discharged into the lumen of the appendix and reach the cæcum, perhaps with some difficulty, but there is no retention unless the channel be interrupted by the position, shape or previous damage of the part, or by fæcal accumulation in the bowels. Thus the process presently declines and comes to a favourable end; but it leaves the appendix damaged, its exterior, including its mesentery, being adherent and matted; its substance twisted, bent or curled, and infiltrated with new weak tissue; its canal possibly stenosed or actually obliterated.

When appendicitis has once begun, this appears to be the most favourable course that it can be expected to pursue; and it is the one to be favoured by treatment, since the alternatives, necrosis and purulent peritonitis of the second stage, are so grave. The leading indications therefore are to arrest the appendicitis at the first stage; to maintain the vitality of the wall of the gut; to provide for limitation of suppuration, should it supervene; and to moderate the amount of damage which the inflammation leaves behind. In other words, we observe the general principles of treating inflammation -to arrest the destructive factor of the disease and the conditions which favour it, and to promote but control the conservative and constructive factors, so that the issue may be in adhesion and repair instead of suppuration; but we modify them in consequence of the peculiar situation and precarious circumstances of the parts involved. Rest is the first object, and it must be immediate, complete and continued. An unfortunate result can often be traced either to unwise attempts to continue at work or to premature movement after early improvement. Rest of the body is secured in bed. Physiological rest of the bowel is promoted by reducing the food to the smallest amount and simplest characters. Inflammatory reaction is controlled by the same means: by the application of hot boric acid fomentations to the right iliac fossa: and in some instances by leeching. This indication would also be fulfilled by clearing the bowel of irritating faeces, and so would the next indication, always of great importance in inflammatory affections

and particularly so in appendicitis, removal of the products. Here there is a clashing of indications; and we have to discuss and settle the question of purgatives in the first stage of perityphlitis, on which there are still two opinions: the one that they do good and should be given, the other that they do harm and are to be strictly withheld. Purgatives would empty the cæcum, and thus relieve pressure and traction on the appendix, insure rest of the gut, which cannot be obtained with a fæcal mass provoking peristalsis within it, and promote discharge of inflammatory products from the appendix. All these are desirable objects. On the contrary, the active movements of the bowel attending purgation cannot but injure the inflamed part, and it is believed that during the first forty-eight hours the condition of the appendix is often critical and that very little damage would suffice to lower its vitality and set up peritonitis, to be presently described. Want of rest would also prevent the formation of adhesions calculated to limit suppuration which may supervene. The rule therefore of our highest authorities is to avoid purgatives for the first three days. It had long been the practice to carry the principle of rest to the other extreme and give opium at short intervals so as to paralyse the bowel. Now opium may still be correctly given in the invasion of appendicitis; *but not to paralyse the bowel.* It is demanded, as we shall presently see, for pain and collapse and restlessness: its effects in checking intestinal secretion, in aggravating constipation (which provokes intestinal unrest), and in other directions, are altogether unfortunate; and we cannot too clearly understand that opium will not prevent micro-organisms from penetrating the intestinal walls if their vitality have been destroyed. The rule therefore is to withhold opium in appendicitis unless it be demanded by pain and collapse; and when it is given, to withdraw it as soon as these have disappeared. The old method of combining calomel with opium perhaps ought to be revived. The mercurial prevents complete arrest of the secretions, and appears to control inflammatory reaction.

When the first seventy-two hours are passed safely and it is clear that the immediate danger of acute necrosis and general septic peritonitis is over, evacuation of the bowels, which

certainly is calculated to arrest the progress of the disease towards the peritoneum as we have already seen, ought to be practised. Opium is stopped if it have been ordered; and a large enema of warm water or soap and water is given. A copious motion is usually obtained, and both locally and constitutionally there is evidence of relief of the inflamed bowel. The empty gut now enjoys natural instead of artificial rest; and its secretions return and are drained away. The enema should be repeated daily, all being well: or after two days a purgative saline may be given by the mouth. Meanwhile bodily rest, the local applications, and a diet mainly consisting of light broths are continued, all intended to secure the same end. In this simple way the pathological process in the large majority of cases of appendicitis is safely conducted to resolution, necessarily however incomplete.

Instead of terminating in resolution, the inflammatory process within and about the appendix may proceed to necrosis of the wall and involvement of the peritoneum in the septic process. This constitutes suppurative perityphlitis. It is the work as we have seen of micro-organisms from the interior, which succeed in attacking and penetrating the tissues of the wall when its vital resistance fails. Occasionally this happens, or appears to happen, from the very commencement of the disease, acute general peritonitis with necrosis of the appendix being the result of immediate destruction of the vital resistance of the gut. In these cases the process, that is the micro-organisms, will be very virulent. When the disease is developed in this fulminating form, the abdomen must be opened without delay unless the condition of the patient be so grave as to forbid interference.

Much more frequently, the septic part of the process is not developed for several days. The vital resistance of the walls appears to be destroyed slowly, and might be preserved by correct treatment. Here is our opportunity. It is believed that the most common cause of this loss of nutritive activity and resistance, that is, the most common cause of vulnerability, of the part, is damage by a previous attack, which as we have seen leaves the appendix adherent, perhaps tightly constricted, bent or curled externally, infiltrated with a lowly-

organised tissue in its coats, atonic as regards its muscular or peristaltic function, and stenosed or even obliterated in its lumen. Fresh appendicitis in such circumstances has two obvious effects on the organ, namely, retention of the products within it, and strangulation of it and perhaps of its mesentery and vessels from without, the one effect reinforcing the other. In these facts we find the plainest indication for preventing perityphlitis by the deliberate removal of the appendix after recovery from the first attack of appendicitis. A less common cause of this train of events is abnormality of position, length, or shape of the appendix: even in the first attack the wall then yields and perityphlitis ensues. A third cause is important from our present point of view—constipation with distension of the cæcum, which may tighten and strangle the mesenteric vessels of the appendix, or perhaps twist, kink or compress it or them, or possibly prevent drainage of its interior by blocking the mouth of the organ. These considerations indicate the correct treatment of the disease as far as it depends on pathological conditions after the third day. The appendix should be drained into the cæcum, the cæcum emptied, micro-organisms and concretions swept away if possible, and the circulation freed within the intestinal walls. Purgatives would accomplish these objects; and we now appreciate more fully the rationale and employment of these in the form of enema or saline, which we noticed in our study of the first stage. It is obvious, however, that purgatives may entirely fail to affect so complex and critical a pathological condition; and it is possible that they may sometimes do more harm than good. In either event the destructive process is not arrested. The micro-organisms, meeting with no vital opposition, penetrate into the peritoneal cavity and set up suppuration there; and they kill the wall *en route*, so that it perishes bodily or perforates under the internal tension. The pathological process is now complete, for though it may persist for weeks, this is but a matter of anatomy: of location, of localization, of spread, of burrowing, of rupture inwardly or outwardly, of involvement of veins and portal phlebitis, of pyæmia and of other complications. For this train of events there is but one kind of treatment indicated:

to cut into the affected region, evacuate the inflammatory products and establish drainage. Sometimes the appendix is removed bodily. All measures short of operation, such as the administration of opium, are useless; and although an abscess may sometimes be safely left within the peritoneal cavity, the proceeding is entirely unsound, and the patient recovers not because of the treatment employed but in spite of it, possibly with external or internal fistula, and with great liability to another attack.

Clinical Indications.—The ætiological and pathological relations of appendicitis and perityphlitis, vital although they be, are incomplete as indications for treatment without certain features of the two diseases which can only be ascertained by clinical observation, that is, which disappear *post mortem*. These are chiefly pain, collapse, sickness, anxiety, restlessness, fever, and other less important symptoms and signs. There is here an urgent indication to relieve distress and avert death, the danger of which is in part directly due to these conditions. But it cannot be repeated too often that the clinical phenomena of appendicitis and perityphlitis are useful and safe guides to treatment only when they are properly employed. Interpreted as significant of the different types, phases and stages of the complex pathological processes which we have just studied, they determine our course of action. Regarded as separate and independent conditions which are to be controlled as such, irrespective of what may be behind or beneath them, they lead us into the gravest perils.

The presence and severity of the radical symptoms of perityphlitis—pain, collapse, vomiting and interference with the functions of the bowels—are almost our sole guides to the type of the disease at its commencement. They determine therefore the question of immediate operation: for the physical signs avail us little unless it be by their negative characters. During the next few days every further clinical observation helps to solve the crucial problem as to which direction the appendicitis is taking, plastic or suppurative: the pulse, the temperature, the occurrence or not of rigors, the sensations and aspect of the patient, the physical signs as they develop and change from time to time, or it may be

the occurrence of relapse after improvement. Different authorities attach particular importance to these different facts respectively as guides to operation. Some surgeons operate if the pulse rise definitely above 120. Others are more influenced by the temperature. Others again order their treatment by the day of the disease, operating on the second day or the third day, if no improvement be manifest. Still other authorities decline to follow any of these rules but guide their action by the cause of the perityphlitis. It may also be regarded as accepted by most surgeons that a suspicion of suppuration warrants operation, which in skilful hands can do no harm even if it prove to have been unnecessary.

Such is the way in which the experienced practitioner regards and deals with the symptoms of perityphlitis. He values them for the information which they convey. He dreads to interfere with them lest he find himself without guides to treatment. He therefore hesitates to mask them by giving opium if he can avoid it. At the same time there are but few cases of this disease in which opium and other means must not be employed to relieve urgent distress or danger in addition to affording rest as we have already seen. The clinical rule is therefore to give at once at the invasion of the illness a sufficient amount of morphine or of morphine and atropine hypodermically to control the pain, vomiting, collapse, and restlessness, and afford the patient a degree of comfort; or it may be a combination of opium and extract of belladonna, or of opium and calomel, by the mouth. As soon as these symptoms have been subdued, all powerful drugs should be stopped, as being harmful as well as useless, and local applications only employed. Not only does opium mask valuable symptoms which are our only guides to a correct diagnosis of the complex and critical processes within and around the appendix; if unnecessarily continued, it deludes the practitioner into regarding as treatment what is nothing of the kind, and persuades him to fatal procrastination in surgical interference; it delays the processes of natural recovery; and it aggravates the cause when this is gout and portal congestion.

Other kinds of distress of less severity and urgency call

for ordinary attention. The sense of local fulness, tension and discomfort is remarkably relieved by evacuation of the bowels. Moderate pain ought to be relieved directly by local applications only. The fever of appendicitis calls for no direct treatment beyond the ordinary attention of the nurse.

Nourishment in appendicitis should be managed on the principles laid down in connexion with acute peritonitis. For the first few hours it must be *nil*. It must be very sparing for several days, fluid only, composed of some materials such as broth or peptonised milk or malted foods which are completely digested in the stomach and upper bowel, and non-flatulent. Milk in its natural form is contraindicated, for undigested curds cause mechanical damage, block the bowels, and generate the gases of tympanites. As much and as long rest as possible should be given the alimentary canal. Thirst is relieved with sips of hot water, or with occasional enemata of normal saline fluid. Stimulants may be necessary to relieve the collapse of invasion; but ought to be given up when no longer indicated. If suppurative perityphlitis ensue and surgical treatment be practised, the diet must be recast as required.

Indications from the Course.— Most of the important indications for treatment which flow from a knowledge of the variable, uncertain and precarious course of perityphlitis have been already discussed. Some of the most important measures, positive and negative, are taken in anticipation of coming developments; present relief is withheld lest it lead to future harm. In the great majority of instances early determination of the direction or course which the disease may take is the key to the situation; and in addition to the symptoms and signs already mentioned, the history of one or more previous attacks is most important evidence bearing on this point. Several considerations of cardinal importance must always be kept before the mind. First, perityphlitis is itself the outcome of a variety of different diseases of the appendix and associated parts, that is, begins in different ways calling for different methods of treatment. Secondly, perityphlitis may end in any one of several different ways, for which we must be prepared and against which we

must provide in planning the management of the case. Thirdly, at any moment unfavourable symptoms may develop, a circumstance which demands watchful attention, judgment, resource and promptness of action. Lastly, the majority of cases of perityphlitis recover without surgical treatment, and this fact, if it be properly regarded by the practitioner, will teach him to avoid precipitate and unnecessary interference. In dealing with appendicitis he must know not only when and how to act, but—which is more difficult—how to respect the natural disposition to recovery, avoid meddlesome interference and hold his hand. All this he cannot be expected to do, however large his experience, unless he be acquainted with the principles on which, according to present knowledge, he ought to proceed.

Outline of Practice.

I. Commencement of Case.—A. If evidence of acute necrosis of appendix or general peritonitis: immediate surgical interference (page 528). B. If disease be local: (1) *At invasion and for three days after. General management.*—Rest in bed—immediate, complete and continued; arrangements for illness of at least a fortnight, possibly two months. A nurse with special surgical training. *Diet.*—None for a few hours (p. 532). *Stimulants.*—None, unless brandy be demanded by collapse (p. 532). For thirst, an enema consisting of one pint of tepid water with a teaspoonful of table salt. *Local applications.*—Hot fomentations of saturated solution of boric acid to lower half of abdomen (p. 526). *Medicines.*—No purgatives (p. 527). For pain and collapse if present (p. 531): (1) ℞ Injectionis Morphinæ Hypodermicæ ♏ v-x, Liquoris Atropinæ Sulphatis ♏ i. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{4}$-$\frac{1}{2}$, Atropinæ Sulphatis gr. $\frac{1}{100}$, Aquæ Destillatæ ♏ v-x.] At once hypodermically; repeated in half an hour if pain and collapse continue. Or (2) ℞ Extracti Opii gr. $\frac{1}{2}$, Extracti Belladonnæ Viridis gr. $\frac{1}{2}$. [U.S.P. ℞ Extracti Opii gr. $\frac{1}{2}$, Extracti Belladonnæ Foliorum Alcoholici gr. $\frac{1}{3}$.] Every three or four hours whilst pain continues. Or (3) ℞ Opii gr. i, Hydrargyri

Subchloridi gr. $\frac{1}{2}$. [U.S.P. ℞ Pulveris Opii gr. i, Hydrargyri Chloridi Mitis gr. $\frac{1}{2}$.] Every three or four hours.

(2) *At the end of invasion.*—(*a*) *If pain continue:* repeat morphine and atropine or opium and belladonna, as condition demands. (*b*) *If pain have moderated:* stop opium and other medicines (pp. 528, 531); and continue local applications to relieve discomfort. *Diet.*—Beef tea, plain broths, meat essences or jellies, peptonized milk. Feeds not to exceed $2\frac{1}{2}$ fluid ounces, at intervals of two hours.

II. Progress of the Case.—(1) *On second, third or later day*, if evidence of suppuration or acute peritonitis supervene (for guides, see p. 531) interfere surgically. If no evidence of pus, actual or threatening by the third day, give enema of one pint of warm water with a little soap (p. 528), and repeat every morning; adding in a few days two teaspoonfuls of oil of turpentine beaten up in yolk of egg. Continue strict rest and local applications. *Diet.*—Peptonized or malted infant food to replace two of the feeds of peptonized milk.

(2) *After a few more days' successful treatment:* stop enemata and give a saline aperient (see p. 520); to be repeated every morning. *Diet.*—Broths and milk thickened with various farinas; bread and butter; eggs; fish; lean underdone mutton; no vegetables. *Later on:* ordinary meals, *excluding:*—milk (except sparingly), whole-meal bread or porridge, strong tea, preserved foods of every kind, common vegetables (but potato puree and spinach permissible), fruits cooked and uncooked, fresh and preserved (but thoroughly stewed apple permitted).—Gradual return to exercise.

III. After Complete Recovery (unless appendix have been removed). *Preventive treatment.—General management.—Clothing* (p. 524): warm woollen garments for lower limbs. Thick-soled boots and shoes. Woollen roller or belt for abdomen.—*Exertion* avoided. *Diet.*—Much as above (II.), all constipating, flatulent and coarse ("aperient") foods being rigidly excluded (p. 524). Bowels to be opened daily either naturally, by above diet, by enema, or by habitual laxative pill taken every evening (see p. 519). *Remedial treatment.*—Consider question of removal of diseased appendix (p. 524).

CHAPTER XXVII.

ACUTE PERITONITIS.

Many of the therapeutical lessons taught by a study of acute peritonitis have been already learned in connexion with appendicitis. In that disease, however, it was the indications for preventing local septic peritonitis (perityphlitis) that occupied most of our attention. In acute general peritonitis we have to deal with a fully established disease, and the most important indications which it illustrates are pathological and clinical. In the first place, we shall see how hopeless are all therapeutic attempts, short of surgical interference, to combat the destructive factor of disease when it is of great virulence and widely distributed, and therewith the utter uselessness and danger of direct "symptomatic" treatment. At the same time we shall be in a position to appreciate the proper place which symptoms and signs should occupy as therapeutical guides, that is, the correct employment of remedies which prove to be indicated after a faithful consideration of the significance of clinical phenomena. In the second place, an opportunity will be afforded us once more of learning the proper province of palliative treatment. We shall discover in acute peritonitis an urgent call for the relief of depression, disorder and distress (collapse) until such time as remedial measures can be employed; we shall see how this object may be attained; but at the same time it will be brought home to us how useless and dangerous palliative treatment becomes if the temporary improvement which follows it be misinterpreted and permitted to divert our attention from the radical indications furnished by pathology.

Ætiological Indications. — When the cause of acute peritonitis is a specific micro-organism, it is to be attacked directly. The surgeon opens the peritoneal cavity, deals with the primary disease whatever it may be, in bowel, stomach, glands, uterus, etc.; removes every trace of sero-fibrinous material or pus; disinfects the parts; and establishes drainage. This is his method when the germs of the disease have entered from without through a wound, or from within by ulceration, rupture, or lowered vitality of the intestinal wall in consequence of strangulation or the like. It is a grave proceeding, and in many instances the constitutional state of the patient forbids it; but it is very rarely more serious in its effects than leaving the patient alone. The only other method of reaching the cause within the abdominal cavity is by means of purgatives. These drain away the septic products, at least, of the micro-organisms, if not the micro-organisms themselves, and produce at the same time other effects on the pathological process which will be discussed presently. Salines are the purgatives generally selected, because they secure a large flow of water from the bowel, and are speedy and not too depressant in their action. Specific medicinal remedies are occasionally useful. Quinine perhaps may be given in septic peritonitis, salicylates certainly in rheumatic peritonitis, a very rare but real disease; but neither unfortunately with much prospect of benefit. On the whole, the great advance that has been made in the treatment of acute peritonitis during the last few years depends on this, that the notion of "idiopathic" peritonitis has been practically discarded, and that the real causes of the disease in its dangerous forms, micro-organisms, are boldly attacked *in situ*. Not the peritoneum but the morbific agent left in the peritoneum is now regarded as the chief element of danger in this grave disease: not interference with it but dread of interference with it is held to be the common cause of death. It may be added that some of the most important operations of abdominal surgery are undertaken to *prevent* peritonitis. Strangulated hernia, intestinal obstruction in many of its forms, threatening perforations of different organs, abscesses localized in or near the peritoneal cavity, especially perityphlitis, and extra-uterine fœtation are examples of the morbid conditions

now summarily dealt with by the surgeon in order to avert peritonitis by the penetration or incursion of infective organisms. We have seen in discussing appendicitis how the same principle underlies the simple methods of purgation and judicious feeding in acute abdominal disease.

In many instances the causes of acute peritonitis are fortunately non-specific. The disease is but the result of inflammatory reaction to a simple physical irritation, and takes the form of dry or adhesive peritonitis around the gall-bladder, at the base of an ulcer, or in connexion with a tumour or an enlarged organ. The causes here may call for interference; but if so it is on their own account, not on account of the peritonitis, which is usually protective in its effect as we shall see presently.

Pathological Indications.—In addition to the general principles of treatment of inflammation, two considerations determine the course that should be followed in dealing with acute peritonitis from its pathological side. These are, first, its situation, whether general or local; second, its kind or nature, whether septic or not.

The destructive factor of acute general septic peritonitis is directly arrested by the surgeon when he opens the cavity and deals with the cause which he finds at work. Success depends greatly on interference early, that is, before the morbid process has become general and produces its many evil effects locally and constitutionally, on the nervous and circulatory systems. Attempts to arrest the disease by increasing the tissue resistance—so invaluable in chronic inflammations, and even in acute ulcerous and inflammatory processes when they are localized—are vain here, for the issue is determined in a few hours. Serum injections possibly have saved a certain number of cases. Stimulants and opium may be of service in acute peritonitis, as will presently appear, but not by controlling the pathological elements of the disease.

The question of the application of general principles to the treatment of septic peritonitis introduces us to a subject of great practical difficulty, on which opinion has changed much during recent years and is still unsettled. Ought rest to be afforded to the intestine in acute septic peritonitis? Both rest

and relief from pain are indicated by the spontaneous cessation of the respiratory movements of the abdominal walls which is so striking a phenomenon in this disease. And if indicated, ought rest to be secured by means of opium? The modern doctrine of the pathology of septic peritonitis, that it is the result of bacterial invasion of the peritoneal cavity, certainly does not support the principle of intestinal rest. Rest could not prevent the entrance of micro-organisms, for this they have already effected. Rest could not expel them; indeed it would retain them. Rest is invaluable in preventing perforation or other coarse causes, as they might be called, of septic infection of the peritoneum; but it will not stop micro-organisms from penetrating a tissue which has lost its vitality and natural resistance, like a strangulated bowel: and when once this has occurred, rest only promotes retention of septic products, favours infection, and wastes precious time. These results must follow the old opium treatment, which also increases the disposition to tympanites, and induces a condition of deceptive relief, encouraging the practitioner in an irrational and, as it too often proved, unsuccessful method of treatment.

As we have just seen, the correct treatment of *general septic* peritonitis is to deal surgically with its cause, the primary disease, if such exist locally. If the condition be beyond interference of this kind, then the bowels are to be sharply moved with a saline purge, regardless of the presence of lymph on their surface, which instead of being protective, as was formerly believed, is known to swarm with septic organisms. The good effects of purgation are several. The septic organisms and their poisonous products are drained away by the bowel, and thus further blood-infection is diminished in degree. The inflamed structures are actively depleted. The enormous accumulation of gas in the bowels, constituting meteorism, is in some degree reduced; and by this means the heart and chest are partially relieved from serious embarrassment. If the bowels contain a collection of faeces, as they do in stercoral typhlitis, their evacuation helps to relieve the neighbouring structures from dangerous pressure or strangulation. Further, in septic peritonitis localized around one portion of bowel, as in appendicitis, the best method of securing that local rest of

the intestine which in this instance is desirable in order to build up protective adhesions, is to empty it, for peristalsis will assuredly continue until all the irritant contents have been discharged.

When these and various associated considerations are reviewed, we discover under which circumstances purgatives are not to be given in acute peritonitis, namely, when they are contraindicated by the primary disease, such as hernia or other form of intestinal obstruction; in localized septic peritonitis, actual or threatening, until sufficient time has elapsed to establish protective adhesions (at least forty-eight hours); and in the non-septic form of the disease. It is necessary to add that purgatives are to be avoided and opium given in all cases seen during the invasion, to prevent death from shock and relieve pain *until surgical help can be obtained;* the deceptive effect on the mind of the practitioner of the relief which will follow the use of this drug being definitely anticipated. Of course opium may also be given to effect euthanasia.

It will be observed that the principle which directs the modern treatment of septic peritonitis is removal of morbid materials, both causes and products, whether by opening the abdomen or through the bowel. A third method of evacuation is sometimes employed, namely, puncture of the intestine. This permits the escape of large volumes of gas, releases the bowel from dangerous internal pressure, relieves the heart and lungs from equally dangerous external pressure, and thus removes several of the elements of collapse.[1] If general septic peritonitis be already present, the question of the safety of puncture need not be raised.

In acute *local septic* peritonitis, on the contrary, of which suppurative perityphlitis is a typical instance, rest is urgently demanded for a time. The guiding principle here is to promote protective and limiting adhesions until the proper time arrives for evacuating the inflammatory products and dealing with the primary disease or cause. This means immediate and complete rest: bodily rest, withdrawal or reduction of food, abstention from purgation, and the use of opium if it should be necessary. Opium may be or may not be required.

[1] Greig Smith, "International Clinics," 1893, 3rd series, vol. i. p. 194.

As a matter of fact it has usually to be given for pain and collapse; but if this be not the case, and if abdominal rest can be secured without it, the opium should be withheld and the drawbacks averted which attend its employment, particularly its effect in concealing the indications for surgical interference, as is fully discussed in connexion with Appendicitis (p. 531). Whilst this treatment is being carried out, the violence of the vascular reaction ought to be controlled, either by leeching over accessible regions like the iliac fossa, or by means of hot fomentations or ice. Local septic peritonitis may at any moment become general either by penetration of the bowel or by bursting of the abscess sac. If this occur, the principles proper to the graver form of the disease immediately come into force, and the abdomen must be opened without delay.

In the *plastic* form of the disease the conservative factor of acute peritonitis is found in full activity; and under these circumstances it is to be encouraged by every means in our power. As elsewhere, the most important measure is rest, especially as pain may be severe: rest of the body as a whole and of the abdominal viscera, particularly such as may be the seat of the primary disease—the stomach in ulcer which threatens to perforate, the bowel in typhoid fever, or an ovarian cyst with thin walls under high tension. For the same reason the diet must be sparing, and consist of small frequent feeds of fluid, non-flatulent, predigested food; and the bowels should not be moved for several days, lest protective adhesions be disturbed. Under these circumstances opium is indicated in full, repeated doses; and this drug at the same time calms the mind, induces sleep, and combats vomiting and depression. In most instances, however, it may be acknowledged that plastic peritonitis subsides spontaneously: indeed the first evidence of its having existed may be found only in the form of adhesions when the abdomen is opened, either *post mortem* or by operation, years later.

Clinical Indications.—The clinical phenomena of peritonitis—collapse, pain, vomiting and the many facts discovered by physical examination—afford the usual two series of important indications. The first of these are derived from them

in their relation as symptoms and signs of a pathological process of great and urgent gravity. Properly employed from this point of view, they suggest the various considerations which we have just discussed under the head of Pathology and in our study of Appendicitis. But at the same time the experienced practitioner recognises in the condition of his patient urgent evidences of constitutional disturbance which demands immediate relief for its own sake. The nervous system and circulation must be at once put in a position to resist the profound depression which attends collapse and the absorption of septic products. It is universally acknowledged that opium possesses this invaluable action. Opium—best in the form of a hypodermic injection of morphine—is to be given at once subject to the conditions already determined, namely, that the repetition of it is to be subordinated to the pathological indications, and that the practitioner is prepared for the liability to be deceived by the improvement which attends its administration, and will therefore resist the temptation to do this and nothing more. Therewith stimulants will have to be ordered, warm applications of the lightest possible description, and careful nursing generally, particularly measures calculated to restore the body heat. If hope be entirely abandoned, euthanasia would be secured by means of the same invaluable drug.

The preceding discussion will have served to bring home to the mind of the student the value of pathological knowledge in the management of even the simplest details of treatment, such as diet, and the correctness of the principles at which we arrived in the chapter on Food. Not food but the absence of food from the alimentary canal is the first means of rational treatment in this direction. At the commencement of acute peritonitis nourishment must give way to other and far more urgent considerations. If life is to be saved, it will not be by means of food. We are not dealing with typhoid fever which runs a course of three or four weeks, but with a disease which often proves fatal within forty-eight hours. Stimulants given by bowel or subcutaneously, or in some instances by the mouth in a very small quantity (a teaspoonful) of water, will relieve thirst and assist the hot applications used externally in restoring the circulation; but during the invasion of peritonitis

food could do no good even if it were absorbed, which is improbable. On the contrary it might do irreparable harm, by promoting vomiting and flatulence, not to mention actual extravasation in perforation of the stomach, an occasional cause of acute peritonitis. In local peritonitis, septic or simple, the same rule should be followed for some hours. Later on, when operation has been performed, or a saline aperient given, or the disease proved to be either local or non-septic, liquid nourishment will be regularly administered with special precautions (see *Appendicitis—Perityphlitis*)

Indications from the Course.—Most of the important indications which are to be drawn from a consideration of the course of general septic peritonitis have been referred to incidentally in the preceding paragraphs. Let us here insist once more on the fundamental fact that the best that can be done for peritonitis is to prevent it: it is essentially a secondary disease, preceded, that is, by some mischief, usually local, which we should use every means to prevent from proceeding to so grave a sequel. The next point to be clearly appreciated is the significance of the invasion phenomena of acute septic peritonitis, namely, in part collapse from intense depression of the circulation, in part from the admission of infective substances into the great peritoneal sac. Here is urgent need for the display of some of the highest and rarest qualities of the practitioner—a clear judgment, prompt decision, firm resolution and energetic action. If not this order of mental attributes, at least equal skill will be required at a later stage of the disease when the question of the employment of purgatives *versus* the continuance of opium must be definitely settled. In the face of all these difficulties it is a fortunate circumstance that many of the gravest conditions associated with peritonitis are now treated surgically.

Local septic peritonitis runs a course of perfectly indefinite length, with the probability of unlimited burrowing and the possibility of rupture into the general peritoneal cavity or in other direction at any moment. The indication therefore is to deal surgically with it as soon as pus is formed. Acute local peritonitis of a non-septic kind tends to spontaneous recovery if judiciously treated.

Outline of Practice.

General Management.—Patient in bed. A skilled nurse. Bed covered lightly but warmly. Hot india-rubber water bottles, covered with flannel, to feet and along the limbs if necessary. *Food.*—None at first (p. 541). *Stimulants:* ½-1 fl. oz. brandy in hot water. At once. *Medicines.*—Injectionis Morphinæ Hypodermicæ ♏v-viii. [U.S.P. ℞ Morphinæ Tartratis ⅕-⅓, Aquæ Destillatæ ♏v-x.] At once. *Locally* to abdomen, a light warm boric acid fomentation, covered with very light "protective" tissue. *Question of immediate operation* raised (page 537).

1. If the disease diagnosed to be general septic peritonitis but operation rejected, inject a serum hypodermically. *Medicines.*—A saline purgative (p. 538): ℞ Magnesii Sulphatis gr. 240, Aquæ ℥i. At once. *Diet* (p. 542): Two fluid-ounces of peptonized milk or light broth every two hours. Or feed *per rectum.* Stimulants as demanded by pulse.—This course to be pursued indefinitely. *Catheter* may be required.

2. If the case be diagnosed one of localized septic peritonitis and operation postponed, avoid purgatives, repeat morphine hypodermically in sufficient doses to relieve pain, and follow directions for *perityphlitis* (p. 533).

3. If the case be diagnosed one of localized plastic peritonitis.—*Diet:* Peptonised milk or beef-tea in 5 fl. oz. feeds every three hours. Locally hot fomentations. *Medicines.*—℞ Opii gr. i. Every four hours for twenty-four hours; to be continued at longer intervals for two or three days more (p. 540). *Thereafter*—discontinue opium, and give—Hydrargyri Subchloridi B.P. [Hydrargyri Chloridi Mitis U.S.P.] gr. iv., followed by saline aperient in six hours. *Still later*—gradual return to ordinary diet and movement. Stop local applications but clothe warmly. Attend to primary disease.

4. If disease be diagnosed acute peritonitis from rheumatism or from Bright's disease, attend to the ætiological indications.

CHAPTER XXVIII.

CIRRHOSIS OF THE LIVER.

Cirrhosis of the liver illustrates in a very instructive way several of the great principles of therapeutics. Its ætiology is known, and but for want of self-control on the part of the patient both alcohol and syphilis might be so successfully dealt with as to eliminate the ordinary types of the disease. In connexion with its pathology we meet with remarkable evidences of compensatory processes, particularly collateral circulation, as well as with the unhappy results of unrestrained repair. The clinical history of cirrhosis further affords us abundant opportunity of studying how repeated opportunities may arise, even in an essentially fatal affection, of timely interference therapeutically, whether to control the cause and the pathological process or to relieve distress and maintain life. When we add to all these features of the disease the facts that it is relatively common and that therapeutical influences of a moral as well as a material kind have to be actively employed, it will be seen how interesting the intelligent management of the patient must be to a young practitioner.

Ætiological Indications.—*Preventive Treatment.* For all practical purposes we may say that the prevention of cirrhosis of the liver is identical with the prevention of alcoholism and syphilis. In a few instances the natural resistance of the liver is diminished, namely, when the organ is already congested as a result of cardiac or pulmonary disease or of malaria. Local predisposition is, however, but an insignificant factor compared with the efficient causes.

Remedial Treatment.—When cirrhosis already exists, the ætiological indication is obvious. Alcohol must be removed, that is, forbidden. The virus of syphilis must be attacked with specific remedies, mercury and iodide of potassium. There is plenty of opportunity of acting on this principle in the case of alcoholic cirrhosis. When the first symptoms make their appearance or when temporary arrest has occurred at an early stage, complete abstinence may prevent the progress or recurrence of the disease. The chief difficulty lies with the patient, who refuses to be controlled, unless some alarming event affords his medical attendant an opportunity of driving home his advice. A point of capital importance for the practitioner to observe is the selection of a proper opening or occasion for speaking to the patient plainly and seriously on this subject. The occurrence of ascites is sometimes regarded as the parting of the ways: the stage at which the alcoholic must definitely make his choice whether to attempt to live or to perish in misery. This stage is too late for the purpose; and, besides this, the patient may not be readily convinced of the grave significance of a little fulness of the belly. Hæmatemesis is a far more valuable danger-signal. It often occurs, if at all, early in the course of the disease; it never fails to impress the patient with a feeling of genuine alarm; and it certainly is met with in cases which afterwards recover if care be exercised. We should never fail to improve the occasion under these circumstances.

The advantages of complete abstinence are more than the simple removal of the cause from the hepatic tissues. It also arrests catarrh of the digestive tract (in which, indeed, according to some authorities, cirrhosis really originates [1]) and its attendant miseries, such as vomiting and depression; it favours the return of appetite, digestion and alimentation, which are of cardinal importance in the treatment of the disease as we shall see presently; and it removes some of the greatest difficulties connected with the management of the case, by making the patient altogether less obstinate, disobedient, restless, unstable and resentful of control. Unfortunately we need hardly dwell upon the difference between

[1] Krawkow, *Arch. de méd. expér. et d'anat. path.*, Paris, 1896, tome viii. p. 269.

planning this treatment and carrying it out. As a matter of fact, the advice is very rarely taken. Under certain other circumstances and in certain individuals, a small quantity of alcohol may have to be allowed.

Pathological Indications. — The chief pathological points to be kept before the mind in studying the objects of treatment in alcoholic cirrhosis are: the degeneration of the hepatic cells; the fibrosis or over-growth of connective tissue; the effects of the disease upon the portal circulation; and the associated diseases and disorders of other organs.

The degeneration of the hepatic cells appears to represent the destructive factor of the pathological process. It is in part a direct or indirect effect of alcohol; in part—as far as it is fatty in nature—an effect of the fibrosis. The indication is to arrest the degeneration before it become complete, and to regenerate the cells directly, if possible, in addition to dealing with the cause. It is doubtful how far this is practicable. Regeneration of hepatic cells does occur under favourable circumstances;[1] and even compensatory hypertrophy of lobules or of one lobe may be set up; but these demand time, a reduced amount of functional excitement (not complete rest), careful nourishment, and a sufficient supply of oxygen. They are promoted also by measures that influence metabolism, of which the non-medicinal are likely to be more effective than the medicinal. A well-regulated life, a spare, light, unstimulating diet, teetotalism, healthy exercise in the open air, and a fair amount of work or other wholesome occupation should be arranged. Unfortunately, the chronic alcoholic seldom will have the disposition or patience to submit to such a course of treatment. Arsenic may also be tried.

The growth of connective tissue appears to represent an attempt at repair as a factor of the morbid process, but it is in unfortunate excess as regards its ultimate effect on the cells, on the blood vessels and on the bile ducts. The indication is to control it; but we possess no means of doing so in alcoholic hepatitis, beyond our usually unsuccessful control of the cause. We drain the portal vessels with purgatives, and we

[1] Rolleston and Fenton, "On the Cirrhotic Liver," *Birmingham Med. Rev.*, Oct. 1896, p. 199.

prescribe mercury and potassium iodide, apparently with little or no effect on the fibrosis. It is probably different in the early stage of syphilitic hepatitis, where the free administration of iodides unquestionably reduces the bulk of the liver and restores healthy hepatic function.

The effects on the portal circulation are most profitably considered, from the therapeutic point of view, first, as they are met with in the earlier stage of cirrhosis, and secondly, in the later stage, that is, after the appearance of ascites, it being understood that this division is but a very rough one. The condition of the portal system in the earlier stage of cirrhosis is full of instruction to the therapeutist. Whilst the tension consequent on interlobular obstruction is partly relieved by intestinal fluxes and possibly by hæmatemesis and bleeding piles, a collateral circulation is being established between the general circulation and the portal radicles. The first indication here is to promote collateral circulation through Sappey's veins in the suspensory and falciform ligaments, the gastro-œsophageal and hæmorrhoidal connexions in the alimentary canal, the abundant retroperitoneal inosculations, and the many junctions of portal radicles with parietal vessels. These extensive anastomoses not only relieve the pressure within the portal system: they maintain the supply of blood rich in alimentary products by short-circuiting, as it were, the circulation at a critical point, and thus they successfully avert one grave consequence of disease of the liver. By operations designed to produce plastic perihepatitis ending in adhesion we copy and increase this natural means of circulatory restitution. Further, observation teaches us that attention to the general circulation—the heart, systemic vessels and kidneys—is of great value in cirrhosis, and it is probably in some measure through these associated channels that the effect is produced. We must therefore employ means to invigorate the heart, raise the arterial pressure and promote diuresis. Massage and local support or pressure on the abdomen are calculated to increase the desired effect. An indirect or complementary method of aiding what we may call collateral nutrition is to throw more work upon the lymphatic absorbents, since the portal route is blocked. Fats

and oils might be ordered in comparative excess, but the condition of the patient's appetite usually forbids them, unless they be supplied in attractive forms, such as milk, yolk of egg, bread and butter, and savoury bacon.

The second indication drawn from the effects of portal obstruction is to relieve it backwards by permitting or even encouraging or copying one or other of the processes by which the abnormal pressure is automatically reduced. These are mainly two—fluxes or catarrhs, and hæmorrhages. The habitually loose bowels of the chronic alcoholic and indeed the more severe drain, possibly blood-stained, which occurs from time to time, must be very cautiously checked, and this not by means of opium, unless it be otherwise uncontrollable, but with a combination of magnesium sulphate and diluted sulphuric acid, external applications, and a bland diet of milk and the like. If a salutary drain from the loaded vessels of the intestines be not already spontaneously established, we induce it by a daily saline purge, the great value of which may be gauged by the fact that it constitutes the chief part of the medicinal treatment in every case of early cirrhosis. Hæmorrhage from the gastro-œsophageal, hæmorrhoidal or other veins is usually treated with vegetable astringents only, which are useless because they do not come into more than momentary contact with the bleeding vessels. Here again sulphates of sodium and magnesium combined with alum and diluted sulphuric acid would be more rational remedies than tannic and gallic acids. But the wise practitioner, knowing his patient, very often abstains altogether from prescribing hæmostatics, and confines his attention to bodily and as far as possible gastro-intestinal rest and the relief of distress. As a matter of fact, recovery generally occurs spontaneously when the tension is relieved. It is possible that recourse would be had more frequently than is now the case to abstraction of blood from the portal system, in imitation or anticipation of nature, by leeching round the anus or umbilicus were there not some difficulty in checking bleeding from leech-bites in these situations.

In the more advanced stage of cirrhosis, spontaneous relief occurs by the last of all automatic methods of relieving mechanical congestion, namely dropsy. This affords temporary

reprieve from worse evils, the backward pressure spending itself on a highly distensile elastic sac. Ascites has so obviously this significance that removal of it directly or indirectly ought not to be delayed. Saturated solutions of purgative salts often answer the purpose; but are a somewhat severe, tedious and unpleasant means of effecting what can be so expeditiously and comfortably accomplished by paracentesis, and repeated again and again without danger. At any rate when the abdominal and thoracic viscera begin to suffer from compression the fluid must be removed by operation. The indications for paracentesis are mainly derived from the amount of urine, the pulse, the respiration and other pulmonary symptoms, the actual girth of the abdomen, and the general state of the patient as regards his aspect, strength and feelings. Repeated tappings are sometimes followed by disappearance of the dropsy; and it is believed that in these instances the collateral circulation has come to be established. Diuretics have but little influence in dispelling ascites due to cirrhosis; resin of copaiba however occasionally does produce a free flow of urine and may be tried in suitable cases.

Associated diseases of other organs are partly alcoholic in nature: neuritis, renal disease, dementia, etc.; partly consequences of the hepatic cirrhosis, as we have seen: gastric catarrh, disturbances of the thoracic viscera, dropsy of the feet; partly related to it in a loose pathological way, such as tuberculosis and cardiac disease. They call for attention accordingly.

Clinical Indications.—Cirrhosis of the liver is beset clinically with distress and danger of many kinds, the former requiring to be relieved, the latter to be averted. Anorexia, dyspepsia, nausea, vomiting, hæmatemesis, diarrhœa, rectal hæmorrhage, jaundice and its attendant phenomena, dyspnœa, depression, prostration and insomnia are perhaps the chief. A corresponding series of remedies are indicated; but these must not be selected or employed in routine fashion. The practitioner must regard the troubles which he is attempting to treat as symptomatic or significant of something that lies deeper: and the indications which he draws from them must be strictly subordinated to the fundamental considerations

which we have already discussed. The significance of diarrhœa and hæmatemesis especially has to be remembered, and the objection to premature interference with them; also the radical objection to the use of stimulants, for which the patient craves, to relieve depression and anorexia. Notwithstanding all this, there may be real danger as well as discomfort in some of these symptoms; and even fundamental indications must give way temporarily when this is the case. Thus diarrhœa (enteric catarrh) may become excessive, and perhaps hæmorrhagic, and call for astringents, opium included. The best form for this purpose is a combination of sulphates such as magnesium sulphate, alum and diluted sulphuric acid; and acetate of morphine or tincture of opium may also be prescribed in nervous, restless or critical cases. At the same time, a diet of peptonised milk, warmth to the abdomen and complete rest in bed must be employed. Vomiting demands special feeding with peptonised milk, kouniss, beef essences, or even nutrient enemata, epigastric applications, gastric sedatives and antacids, such as diluted prussic acid, bismuth and soda, and calomel if there be no intestinal catarrh. Hæmatemesis must never be lightly regarded. In spite of the relief it often affords, it proves fatal in some instances. Complete abstinence from food for twenty-four hours, followed, if necessary, by rectal alimentation; sips of quite hot water, very small pieces of ice, or an enema of normal saline solution to relieve the urgent thirst; and a hypodermic injection of morphine, sufficient to allay sickness and produce bodily and mental quiet and sleep: these are the best measures. Ordinary astringents and constringents, like iron and tannic acid, cannot possibly affect bleeding at the cardiac orifice of the stomach; they ought not to be given therefore, particularly as they would aggravate the gastric catarrh and lock up the bowels. Insomnia will yield most readily to chloral hydrate and bromides in proper combination or to the morphine injection, and the same drugs are calculated to be successful in delirium and in nocturnal restlessness. Depression is best met, as it occurs, with aromatic, bitter, pungent and carminative tinctures in combination with sal volatile, digitalis and nux vomica; and a special effort should be made to find some nutritious and

stimulant food which is at the same time attractive. This again introduces us to the subject of alimentation.

The great difficulties attending feeding in cirrhosis of the liver are best appreciated on consideration of the previous indications. With a demand for nourishment, to remove depression, exhaustion, emaciation and cardiac weakness, and to promote recovery generally, there exist complete anorexia, very often a highly irritable condition of the stomach, and the necessity for hepatic, gastric and intestinal rest. It is obvious that the diet must possess certain definite characters. It must be, first, attractive or at least tolerable—if possible actually tempting; secondly, very digestible, possibly predigested; thirdly, highly nutritious; fourthly, not too liquid, lest it aggravate dropsy. The kinds of food best adapted to fulfil these requirements, in different phases of the disease and in different patients, are milk, eggs, farinaceous materials, uncooked oysters, tripe, fish specially prepared, chicken and game. From these, in different combinations, a considerable variety of dishes for different meals may be arranged. Coffee and tea may be permitted in moderate quantities, morning and afternoon. When distress is urgent, particularly in the form of vomiting, nothing but fluids can be taken and tolerated, and these only in small quantities, at short intervals. Milk or koumiss is best. The question of stimulants has been already discussed. When it is found to be absolutely necessary to allow a little stimulant because of the state of the heart, from complete and persistent inability to eat without drinking, or from other circumstance connected with the alcoholism, the particular form of alcohol ordered will be indicated by the patient's taste and habits, as well as by other obvious considerations. Alcoholics are often "thirsty souls," and may take willingly stout diluted with an equal quantity of soda water, or the imperial drink with one or two fluid drachms of spirit in it. But it must be understood that these are exceptional allowances, to be withheld if possible, particularly in ascites. When vomiting is intractable, champagne or brandy-and-soda must be given for a day or two.

Elimination must be faithfully attended to in cirrhosis of the liver; the bowels, kidneys and skin being kept active.

Purgation has been already fully discussed. The urine is stimulated to flow in response to salines, milk, etc.: but the hydragogue motions tend to keep the quantity down. Heavy sweats are not uncommon, so that the skin will have to be under the particular care of the nurse.

Indications from the Course.—As we have already seen under the head of its pathology, cirrhosis of the liver presents two fairly-defined stages. The earlier of these might be called from our point of view the stage of curability, when we are still in time to interfere, if the occurrence of gastric or enteric catarrh, fits of more active alcoholism followed by depression, and especially the occurrence of hæmatemesis afford us opportunities of doing so and frightening the patient into salutary reform. When the phenomena significant of the later or advanced stage make their appearance, of which ascites is the most prominent, remedy is usually hopeless, and relief is the aim of the practitioner, with prolongation of existence for a few months as the result of attention. In a very small proportion of cases, however, relief is presently followed by evidences of so much unmistakable improvement in the condition of the patient as a whole that some recuperative change must have occurred in the pathological process by way of compensation. This is mainly the establishment of collateral circulation between the portal and the systemic veins; or, it may be, the re-establishment of this connexion after an interruption coincident with the appearance of urgent symptoms. If we might assume that the anastomosis is precarious, that is, just sufficient to relieve portal obstruction and ascites, there would be no difficulty in understanding how the patient might be kept alive for an indefinite time by scrupulous attention to bowels, diet, and the heart and kidneys. These considerations should be practically entertained in the management of those cases of cirrhosis where improvement sets in after several tappings. They ought also to encourage us to tap early and to tap repeatedly if necessary, in the hope of affording the anastomotic branches an opportunity of opening up when the vigour of the circulation is restored.

After a time, compensation breaks down from some cause or other. The first condition of success, abstinence from alcohol,

is usually wanting. The functions of the different organs indispensable to maintenance of the circulation through the new channel are disturbed and depressed. The disease in the liver advances. Under these circumstances death approaches apace, unless assistance be afforded. Intelligent interference may at least postpone the fatal termination if it cannot entirely avert it. Such interference must be based on a knowledge of the cause of failure. In the great majority of instances this is continued alcoholism, with consequent progress of the pathological process in the liver. Acute hepatic congestion, referable to cold, or a debauch or both, less often upsets the balance. Failure of the heart and mechanical congestion of the liver will also precipitate ascites in such a case, mainly through the hepatic veins, partly no doubt *viâ* the collateral anastomoses with the portal radicles. Another cause of breakdown from rise of portal tension is arrest of the action of the bowels. It will be obvious that several of these disturbances are of a temporary character, and capable of removal or control. Rest, warmth, low diet, brisk purgation, attention to the heart, or a critical hæmorrhage judiciously permitted, may afford in different instances at least temporary relief. When these have failed, vigorous attention to ascites, if necessary by repeated tappings, has frequently sufficed to restore tolerable health. Unhappily it is only in exceptional cases that we can work for recovery. Ultimately the phenomena of toxæmia, incorrectly known as cholæmia, supervene, and the patient dies comatose, if he have not perished earlier of one of the many troubles or of some of the other diseases with which cirrhosis is so often associated, including renal and cardiac disease and tuberculosis. Under these circumstances no treatment is of avail.

Outline of Practice

A. Alcoholic Cirrhosis. 1. First or Early Stage.—*General Management.*—Institute treatment for alcoholism (p. 545). Confinement to bed, to room, or to house, according to circumstances; more often patient allowed out. *Diet* (p. 551).—(1) If anorexia, vomiting and purging: milk and soda water, light "teas," jellies, or essences. Thirst to be relieved by these

and by aërated waters or imperial drink. (2) When solids can be taken: oysters, white fish, tripe, game; dressed vegetables. Later, cutlets with tomato or other piquant sauce or condiment. Still later, ordinary mixed diet. For breakfast—eggs and mild bacon or fat ham.

Medicines.—(1) A saline purgative (p. 548) to be taken every morning: see p. 520. (2) A cathartic pill, to be taken twice a week at first; afterwards once a week: see p. 520. (3) A stomachic and gastric sedative: ℞ Sodii Bicarbonatis gr. xv, Spiritus Ammoniæ Aromatici ♏ x, Infusi Gentianæ Compositi B.P. ad ℥i. Three times a day, five minutes before meals. (4) Later on, to check hepatic degeneration (p. 546): ℞ Liquoris Arsenicalis ♏ iii, Ferri Tartarati gr. v, Potassii Bicarbonatis gr. x, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Liquoris Potassi Arsenitis ♏ iii, Ferri Tartratis gr. v, Potassii Bicarbonatis gr. x, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Three times a day, immediately after meals. (5) For attacks of depression—a gastric and general stimulant (p. 550): ℞ Tincturæ Capsici ♏ iii, Extracti Cinchonæ Liquidi ♏ iii, Tincturæ Digitalis ♏ x, Acidi Nitrici Diluti ♏ x, Tincturæ Cardamomi Compositæ ♏ xxx, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Tincturæ Capsici ♏ iii, Extracti Cinchonæ Fluidi ♏ iii, Tincturæ Digitalis ♏ x, Acidi Nitrici Diluti ♏ x, Tincturæ Cardamomi Compositæ ♏ xxx, Aquæ Chloroformi ℥iv. Aquæ Destillatæ ad ℥i.] At 7 A.M., 11 A.M., 5 P.M.

Complications.—*For Enteric Catarrh* (p. 548).—Rest. *Diet.*—Milk and lime water or peptonised milk, in 2½ fl. oz. feeds. Every two hours. *Medicines.*—℞ Magnesii Sulphatis gr. xx, Acidi Sulphurici Diluti ♏ xv, Aluminis gr. xv, Aquæ Destillatæ ad ℥i. Every six hours.

(2) *For severe Vomiting* (p. 550).—Rest. *Diet.*—At first only sips of hot water, or small pieces of ice, according to taste and effect. Later, 1 to 4 fl. drachms of milk and soda or lime water, or koumiss. A few drops of juice or essence of beef in a little water. Peptonised beef-tea: milk: farinas: champagne (p. 551). Thirst relieved by enema of "normal saline" fluid. *Medicines.*—(1) Gastric sedatives: Hydrargyri Subchloridi gr. iv, Sacchari Lactis gr. ii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. iv, Sacchari Lactis gr. ii.] At night, followed by effervescing saline

aperient after six hours. (2) ℞ Bismuthi Subnitratis gr. xx. In one fl. oz. of milk every three hours. (3) ℞ Acidi Hydrocyanici Diluti ♏iii, Tincturæ Cardamomi Compositæ ♏xxx, Spiritus Ammoniæ Aromatici ♏x, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Acidi Hydrocyanici Diluti ♏iii, Tincturæ Cardamomi Compositæ ♏xxx, Spiritus Ammoniæ Aromatici ♏x, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Every three hours. (4) ℞ Sodii Bicarbonatis gr. xii, Ammonii Carbonatis gr. viii, Aquæ ℥i. Every two or three hours, in a wineglassful of water, effervescing with a tablespoonful of fresh lemon juice.

(3) *For Hematemesis.* Rest in bed.—If nervous anxiety and restlessness: ℞ Injectionis Morphinæ Hypodermicæ ♏v-vii. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{5}$-$\frac{1}{3}$, Aquæ Destillatæ ♏v-vii.] At once hypodermically (p. 550). *Diet.*—Rectal feeding only; see p. 493. *Medicines.*—None by mouth for four hours. Thereupon the above alum and magnesium sulphate mixture, every four hours, for at least twenty-four hours (p. 548).

II. Second or Advanced Stage. *General Management.*—Patient confined to house, to room, or to bed, according to severity of condition. Careful attention to skin (p. 552). *Diet.*—Light solids as before, as long as they can be taken. Otherwise, milk, up to about three pints a day. No stimulants unless urgently indicated by pulse. Imperial drink. *Medicines.*—A powerful saline hydragogue purgative (p. 549): ℞ Magnesii Sulphatis ℥i, Aquæ ℥i. Every morning.—A gastric and general stimulant, as before. *Non-medicinal measures.*—Paracentesis abdominis (p. 549) followed by regular morning saline and a diuretic combination (p. 549): (1) Tincturæ Digitalis ♏x, Tincturæ Scillæ ♏xx, Potassii Acetatis gr. xx, Potassii Iodidi gr. v, Aquæ ad ℥i. [U.S.P. ℞ Tincturæ Digitalis ♏x, Extracti Scillæ Fluidi ♏iv, Potassii Acetatis gr. xx, Potassii Iodidi gr. v, Aquæ Destillatæ ad ℥i.] Four times a day. (2) ℞ Copaibæ Resinæ gr. xv, Misturæ Amygdalæ ad ℥i. [U.S.P. ℞ Resinæ Copaibæ gr. xv, Emulsionis Amygdalæ ad ℥i.] Three times a day. (3) ℞ Potassii Tartratis Acidi gr. xxx, Mellis gr. xc. [U.S.P. ℞ Potassii Bitartratis gr. xxx, Mellis gr. xc.] Three times a day.

If fluid re-accumulate, repeat tapping as often as may be necessary, the same treatment being continued in the intervals.

If the disease be arrested, replace diuretics with tonics (p. 547). Continue saline aperient indefinitely. *Complications.*—To be treated as in the first stage.

B. Syphilitic Cirrhosis.—Plan of treatment as for alcoholic cirrhosis; but (1) *diet* more liberal; and stimulants may sometimes be given with advantage in small quantity. (2) Give specific *medicines*: ℞ Potassii Iodidi gr. x-xx-xxx, Potassii Bicarbonatis gr. xv, Aquæ Camphoræ ʒi. [U.S.P. ℞ Potassii Iodidi gr. x-xx-xxx, Potassii Bicarbonatis gr. xv, Aquæ Camphoræ ʒii, Aquæ Destillatæ ad ʒi.] Three times a day, three hours after meals.

CHAPTER XXIX.

CEREBRAL HÆMORRHAGE.

The therapeutist finds himself in a peculiar position when he attempts to formulate the principles of treatment of cerebral hæmorrhage. He has not to deal with a primary disease, but with the result of a variety of different pathological conditions, the day for the prevention and even for the remedial treatment of which has gone by; partly, indeed, with what is but an event, apoplexy, an instantaneous occurrence. Further, the principles which apply to the treatment of hæmorrhage in general have to be considerably modified, inasmuch as the chief source of anxiety is the damage wrought to the delicate structures around, not the loss of blood.

Ætiological Indications.—*Preventive Treatment.*—The different orders of causes of cerebral hæmorrhage, efficient, predisposing and exciting, are so well known and can be so easily recognised, it may be for months or even years before its occurrence, and hæmorrhage in the event of recovery is so likely to recur, that prevention takes the chief place in what may be broadly called the correct management of the disease as a whole. We must devote the first part of our discussion to this subject.

The first prophylactic indication is to attend to the efficient cause, which is high blood-pressure, absolute or relative. This object is fulfilled by controlling the ingesta, by means of spare and low diet, the avoidance of alcohol (unless it be specially indicated), and the exercise of caution in the use of such drugs as digitalis, strychnine and ammonia. Inasmuch as the patient is usually the subject of chronic Bright's disease,

and possibly of threatening failure of the heart, the caution with respect to drugs is a practical one. Equally necessary is it to promote elimination, the retention of metabolic waste being believed to be a fruitful source of high arterial tension. The value of the routine use of purgatives is obvious in this connexion, as well as of strict attention to the skin.

The second prophylactic indication is to attend to the conditions which predispose to vascular rupture. We must attempt to increase the vital resistance of the walls of the cerebral vessels, that is, to regenerate them. In most instances this end cannot be attained; yet it ought to be a rule of life for those who are obviously liable to the occurrence or the recurrence of cerebral hæmorrhage to attend faithfully to what may be called cerebral hygiene: living a quiet, uneventful life as regards both work and pleasure. More particularly, the subjects of the different kinds of vascular disease must be specially advised in each instance. Arterial degeneration associated with Bright's disease indicates not only the measures proper to that affection, but the careful employment of arsenic and iron, being the only other means (and these poor enough!) likely to restore healthy nutrition. The course to be pursued in arterial sclerosis from chronic alcoholism and strain is equally obvious, and equally unpromising. If the disease which is exposing the arterial wall to rupture be syphilis, the correct treatment is available, and calculated to be perfectly successful. In profound changes in the blood, including purpura, scurvy, leukæmia and pernicious anæmia, the danger of cerebral hæmorrhage is to be averted by the treatment proper to each. The same remark applies to infective endocarditis as a source of acute cerebral aneurysm. Lastly, the hygienic management of aged persons, of certain predisposed subjects recognised as of "apoplectic build" and "habit," and of the members of particular families, ought to include the adoption of measures calculated to preserve the nutrition of their cerebral blood vessels.

The third prophylactic indication is to prevent the occurrence of determining circumstances. The most important of these is probably physical strain, particularly as far as it interferes with the return of blood from the brain through the

veins, that is in stooping, holding the breath, and emptying the bowels. All these causes must be avoided, and so must compression of the veins of the neck by the clothing or by ill-arranged postures in sleep. Indulgence in hearty meals, with alcohol and emotional excitement, ought also to be forbidden in susceptible subjects. Mental strain, associated with functional increase of the cerebral circulation, would obviously be unfavourable; but the effects of moderate intellectual occupation in this direction are no doubt exaggerated; and the effects of compulsory idleness, in this way or by promoting thrombosis, are likely to be worse than those of exercise.

Remedial Treatment.—We proceed to consider the ætiological indications for the treatment of cerebral hæmorrhage during and after its actual occurrence.

Control of the efficient cause, the high blood-pressure, is now by far the most important object of our concern; and it must be effected instantly, inasmuch as we are attempting to attend to a cause still acting and doing further mischief every moment. We proceed without delay to reduce the cardiac force, to reduce the arterial tension, and to favour the flow of venous blood from the brain. A series of simple measures fulfil these associated indications. We place the patient at rest in bed; raise his head and shoulders on the pillow; and attend to freedom of the cervical veins from compression by tight garments or flexion. We turn him on to his side, lest the laboured breathing associated with the dorsal posture interfere with the action of the right chambers of the heart.[1] We may then try the effect of compression of the carotids in the neck as recommended by Horsley and Spencer.[2] Cold applications to the scalp might promote constriction of the arteries. If tension and excitement are great, or if the symptoms are ingravescent,[3] abstraction of blood is indicated, by means of venesection, cupping or leeching. Whether these powerful measures be employed or no, at least three other simple means of reducing the blood-pressure at the bleeding point should

[1] Bowles, "Stertor and Apoplexy," 1891, pp. 26-28

[2] *Brit. Med. Journ.*, London, 1889, vol. i. 457-60.

[3] Gowers, "Diseases of the Nervous System," 1893, vol. ii. p. 412.

never be neglected, namely, purging with croton oil or calomel; employing derivatives in the form of sinapisms or hot bottles to the extremities (whilst careful not to blister an unconscious patient liable to bed-sore); and withholding food and stimulants entirely for a time.

When hæmorrhage has commenced it is too late to regard predisposition as a therapeutic guide. But it is still correct to keep the determining circumstances before our minds. Bodily rest is usually effected by the disease itself, but cerebral excitement must be calmed in milder cases without loss of consciousness; and in these and indeed as a routine practice, the organs of sense and the afferent centres ought to be preserved from even ordinary stimulation by ensuring quiet, by darkening the room, and by avoiding all unnecessary clinical investigation and fussy attempts at feeding.

Pathological Indications. — The first pathological indication in cerebral hæmorrhage is of vital and immediate importance: to arrest the hæmorrhage. In the brain, as elsewhere, there are three methods of accomplishing this object. First, we promote closure of the broken and bleeding point. We encourage spontaneous contraction of the arterial walls by securing cerebral rest and by the application of cold to the head; and we trust in some measure to the pressure which is being spontaneously exerted on the broken vessel by the extravasation around. Ergot is recommended by Gowers.[1] Secondly, we reduce the blood-pressure in the afferent artery, mainly by persevering in the measures already recognised as necessary under ætiology, namely bodily rest in lateral cubitus with the head raised, purgation, abstention from feeding and stimulation, cerebral quiet, and, if necessary, the abstraction of blood. Compression or even ligature of the cervical carotid is a still more powerful means. Drugs with a depressant action on the heart, such as antimony or aconite, are not given. Thirdly, we favour clotting in and around the broken point. Most of the measures already recommended have this effect also, such as rest, elevation of the head, abstraction of blood, purgation, and withholding food and drink; and so has derivation of blood to the extremities.

[1] Gowers, *op. cit.* p. 412.

The second pathological indication in cerebral hæmorrhage is to control inflammatory reaction around the lesion.[1] Fortunately most of the measures already otherwise indicated have an action in this direction; and these are therefore to be continued. Rest of mind and body is imperative. Afferent impressions and voluntary impulses, as the patient emerges from coma, must be reduced to a minimum. Meddlesome suggestions to the patient to try whether he can move the paralysed limbs are particularly objectionable; and the premature use of electricity is also worse than useless. Elevation of the head, cold applications, and attention to the bowels must be continued steadily. Small feeds of milk will be the only nourishment allowed (and this not until the proper time comes) and sips of water; but no alcohol. Some authorities would blister at this stage, and others give circulatory depressants such as aconite.[2]

Removal of the products of the lesion — extravasated blood, inflammatory exudation and *débris*—which are a source of pressure on other parts, ought theoretically to be promoted, but this object probably cannot be assisted except in a constitutional way, by hastening the return of health.

The last pathological indication of special importance is to repair the damaged nervous structures, and to prevent secondary (descending) degenerations and muscular atrophy. The natural course of the disease, time, and general care alone can be credited with these desirable results. It may be questioned whether the torn and bruised fibres are actually repaired: the seat of lesion is represented by cicatrix or cyst. That repair does occur, however, in many instances is proved by the partial recovery of function in the paralysed muscles corresponding to the lesion. Part of this repair is structural; and consists in disappearance of pressure and the associated anæmia of the tissues around the lesion. Part of it is functional (but is most conveniently mentioned here), and consists in disappearance of shock and establishment of compensatory action of the other or unaffected hemisphere.[3] Graduated

[1] Gowers, *op. cit.* pp. 399, 400.
[2] Osler, "Principles and Practice of Medicine," 1895, p. 953.
[3] Gowers, *op. cit.* pp. 76, 78, 80.

exercise of the parts undergoing recovery and of the efferent tracts, nerves and muscles, by systematic employment of voluntary impulses, is theoretically suggested by the analogy of repair in other organs such as joints; and it is possible that the effects of small hæmorrhages are thus more satisfactorily recovered from. At the other extremity of the great motor tract, the functions of the muscles and associated structures are temporarily increased (but not permanently restored) by the methodical employment of sensory stimulation and of exercise in different forms—electricity, massage and strychnine.

Clinical Indications. — Most of the clinical phenomena of cerebral hæmorrhage can now be easily referred to the pathological conditions and causes known to be present, and are properly employed by the therapeutist as guides to indications to be drawn from those. Coma and paralysis, for example, call for treatment mainly as being significant of cerebral injury. At the same time certain of the phenomena demand direct relief. Coma and the attendant disturbances commonly comprised under this name must receive treatment: attention to posture, feeding, dejections, etc., of which the unconscious patient is incapable. Stertor indicates lateral cubitus, being significant of a degree of asphyxia.[1] Paralysis, the most prominent symptom when the shock, stroke or apoplexy is past, comes ultimately to require direct treatment, but this must always be rigidly controlled by the higher considerations derived from the ætiology and pathology of the disease, as we have already seen. Emotional and other mental symptoms, particularly paroxysmal depression, will call for judicious moral control and the most guarded employment of stimulants.

The various indications connected with the elementary functions of life have been incidentally referred to at sufficient length under the previous heads. We have found that there is no need for nourishment for a time, and that the allowance ought to be small indefinitely. Everything is opposed to feeding in cerebral hæmorrhage, unless it be due to some of the rarest causes such as scurvy. We have also seen the absolute necessity for rest, mechanical and nervous, until the time arrives (difficult to determine) when voluntary movements may

[1] Bowles, *loc. cit.* p. 27.

be employed as a form of exercise conducive to recovery. The details of elimination [1] have also been touched on: the motions have to be collected; the bladder has usually to be emptied; the skin must be kept clean; and bed-sores prevented, and treated if they form.

Indications from the Course.—The three well-defined stages or phases which constitute the course of cerebral hæmorrhage make different demands, respectively, on the mental qualities or endowments of the practitioner. In the first stage, the apoplexy, promptness of action is all-important, tempered of course by soundness and discrimination of judgment. The second stage, that of inflammatory reaction, ought to be most carefully determined by attention to the temperature, symptoms of cerebral irritation, acceleration of pulse, etc., and intelligently combated. Lastly, the third stage, that of recovery with permanent hemiplegia, taxes severely the capacity of the medical attendant for inspiring his patient with cheerfulness and contentment. It will be all the more important to do so by personal influence, because recurrence of hæmorrhage might readily be excited by stimulants; whilst thrombosis might occur in the degenerated vessels if the unfortunate subject were allowed to give way to despondency. Of course in many instances the termination of cerebral hæmorrhage is fatal in spite of all treatment, recovery being hopeless from the first. In these cases the treatment indicated is palliative only.

Outline of Practice.

A. Preventive Treatment. *General Management.*—Physical exercise regular but moderate: no exertion, and no straining (p. 558). Posture in sleep (p. 559). Clothing (p. 559). Avoidance of mental excitement (p. 559). Attend to hygiene of skin in particular (p. 558). *Diet.*—Spare. *Stimulants*, none unless specially indicated. *Medicines.*—Caution in use of cardio-vascular stimulants (p. 557). Regular saline aperient (see p. 520) in the morning. Other remedies, as for chronic Bright's disease, alcoholism, syphilis, blood-diseases, etc., as required (p. 558).

[1] Gowers, *op. cit.* p. 413.

B. Remedial Treatment. *First Stage.—General Management.*—One or two nurses. Patient in bed. Posture; attention to neck and head (p. 559), and to stertor (p. 559). Cold to head. Hot india-rubber bottles, covered with flannel, to feet (caution, p. 560). Room darkened and still. Patient undisturbed (pp. 560 and 561). Attention to bladder and rectum (p. 562). Prevent bed-sores. *Diet.*—None for several hours. *Stimulants,* none. *Medicines.*—A selection of rapid hydragogue purgatives: (1) ℞ Olei Crotonis ♏ i. To be mixed with a little butter and applied to the back of the tongue at once. (2) ℞ Pulveris Jalapæ Compositi ʒi. At once. (3) ℞ Pulveris Elaterini Compositi gr. iii. [U.S.P. ℞ Triturationis Elaterini gr. $\frac{3}{4}$.] At once.—A less powerful purgative: ℞ Hydrargyri Subchloridi gr. iv, Sacchari Lactis gr. ii. [U.S.P. ℞ Hydrargyri Chloridi Mitis gr. iv, Sacchari Lactis gr. ii.] At once. To be followed in six hours by an aperient saline.—A hæmostatic: ℞ Extracti Ergotæ Liquidi ʒi, Glycerini ♏ xxx, Aquæ ad ʒi. [U.S.P. ℞ Extracti Ergotæ Fluidi ʒi, Glycerini ♏ xxx, Aquæ Destillatæ ad ʒi.] Every three hours. *Non-medicinal Measures.*—Question of bleeding (p. 559).

Second Stage (*Reaction*).—*General Management.*—Continue the same measures (p. 561). *Diet.*—Sips of water. Milk in $2\frac{1}{2}$ fl. oz. feeds every two hours. *Stimulants,* none. *Medicines.*—Continue milder purgative. Question of cardio-vascular depressants (p. 561).

Third Stage (*Paralysis*).—*General Management.*—Gradual return to physical and mental exercise (p. 562) and to *preventive* measures, as above. Massage and electricity. Value of encouragement. *Diet.*—Gradual return to light solids, etc., as in Preventive Treatment. *Medicines.*—Nervo-muscular stimulants: ℞ Liquoris Strychninæ Hydrochloridi ♏ iii, Tincturæ Aurantii ʒss, Aquæ Chloroformi ad ʒi. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{36}$, Tincturæ Aurantii Amari ʒss, Aquæ Chloroformi ʒiv, Aquæ Destillatæ ad ʒi.] Three times a day after meals.

CHAPTER XXX.

SOFTENING OF THE BRAIN.

THROMBOSIS.

Softening of the brain is one of the most unpromising of diseases from the therapeutical point of view, but still it serves to impress a number of useful lessons on the mind of the student of this subject. He finds in it, as he found in cerebral hæmorrhage, an illustration of the comparative hopelessness of treatment in certain "diseases," as we call them, which are really nothing more than the final phase of an insidious pathological process that has been slowly undermining the nutrition of vital parts, or been a standing danger to the system, for many years. Under these desperate circumstances it turns out that what little prospect there is of recovery lies in two directions, to which we have had frequent occasion to look with some confidence for help in connection with other diseases. First, collateral circulation comes into play, prevents the process of necrosis which is here known as softening, and temporarily at least averts serious damage or death, much as we saw in cirrhosis of the liver but in a somewhat different fashion. But this automatic provision for recovery proves to be vain unless, in the second place, the practitioner in charge of a case of cerebral thrombosis employs his therapeutical guides with intelligent discrimination. If he ignores the principles at which we arrived in our study of clinical indications, by failing to observe the clinical phenomena with due care and to interpret them into ætiological and pathological language, that is, if he proceed to treat apoplexy in a routine

fashion, he will be led to order low diet, to forbid stimulants and to prescribe a smart purgative, with the effect of accelerating instead of preventing failure of the circulation, and probably permitting a fatal issue.

Ætiological Indications.—We are still not sufficiently acquainted with the intimate nature of coagulation of the blood to be able to speak with perfect exactness of the efficient, predisposing and determining causes respectively, of thrombosis of the cerebral vessels. Its ætiology, however, is well understood. The three conditions recognised as producing this disease are lesions of the cerebral vessels, particularly syphilis and atheroma; weakness of the heart; and disturbed states of the blood. Lesions of the arterial walls not only afford points or surfaces on which coagulation may start, but present obstacles or produce actual narrowings in the channel, immediately behind which the current spreads and slackens with a similar result. The effect of cardiac debility is obvious. Either vascular disease or circulatory failure might be sufficient to cause thrombosis; a combination of the two greatly increases the danger, especially the rapid supervention of considerable depression of the heart and blood-pressure on the top of previous atheroma. In many instances the state of the blood itself must be reckoned as a factor of the morbid process, for example in anæmia, cachexia and pregnancy.

Preventive Treatment.—Thrombosis being thus recognised as a secondary affection, the first consideration from the ætiological point of view is how to prevent it; particularly in the subjects of syphilis and atheroma, whether they have already suffered from it, as is not uncommonly the case, or present symptoms significant of its inception, that is, of local circulatory failure. The indication to deal directly with the cause may be followed with good prospect of success in syphilitic subjects. Mercury is ordered, either in the form of inunctions or pill, or combined with potassium iodide. If the latter be given alone, it must be in moderate doses lest it promote clotting as it possibly does in aneurysm.[1] Atheroma is practically beyond repair; it is too late to think of dealing with gout, alcoholism or strain in which the degeneration originated. We turn there-

[1] Gowers, *op. cit.* p. 447.

fore to the other factor of thrombosis, circulatory depression, and attempt to remove it. Our object is to surround the patient with cheerful influences; to give him a generous diet, with a certain allowance of alcohol; and to definitely interdict work that is of a kind, of an amount, or engaged in for a length of time, likely to produce exhaustion.[1] Regular gentle exercise of body and mind, to secure wholesome activity of the blood flow, is favourable; excitement and effort, especially sustained effort, are bad, because they end in the opposite extreme, namely fatigue. The bowels must be regularly but not sharply opened. A course of cardio-vascular tonics, including digitalis or strophanthus, nux vomica, ammonia, iron and perhaps arsenic, is calculated to raise the blood-pressure slowly and steadily, and to increase the nutrition of the walls both of the vessels and the heart. Particular care must be exercised to make a correct diagnosis of the premonitory symptoms of cerebral anæmia, due to failure of the circulation, from those of threatening hæmorrhage, lest lowering remedies—even abstraction of blood—should be employed with unfavourable results. On the contrary, the risk of hæmorrhage must not be forgotten: in our efforts to prevent thrombosis we might excite rupture of the diseased vessel. The stimulant and tonic measures just recommended have to be employed with intelligent caution.

Remedial Treatment. — When cerebral thrombosis has already commenced and calls for remedy, our efforts to improve the activity of the circulation must be increased, inasmuch as this cause is still at work and might be interrupted by timely and well-directed measures, the process of coagulation being moderately slow, at least in the case of atheroma, if unhappily not so in all cases of syphilis. The cerebral circulation is to be quickened by sinapisms to the neck; a *mild* mercurial purgative given, to remove depressing materials from the blood; ammonia and digitalis prescribed in moderate doses at regular intervals; and stimulants ordered or not, as indicated by the state of the heart and pulse, and always in doubtful cases.[2] Otherwise expressed, the ætiological principles to be followed in the treatment of commencing cerebral arterial thrombosis are to *avoid* the depressing measures which may be so urgently

[1] Gowers, *op. cit.* p. 445.

[2] Gowers, *op. cit.* p. 445.

indicated in cerebral hæmorrhage, such as venesection and brisk purgation. The importance of correct diagnosis and accurate appreciation of the ætiology of different cases of apoplexy is obviously vital.

Pathological Indications.—The destructive factors of the pathological process in ordinary cerebral thrombosis are the clotting within the vessel, local anæmia passing on to necrosis (white softening) in which this results, and compression of neighbouring parts. The only conservative or recuperative factor in the process to which we can look with a degree of hope at this stage is the establishment of collateral circulation. Unfortunately this cannot occur in connexion with the central vessels, from want of anastomosis. Indeed, in lesions of the cortex, where anastomosis is comparatively free, the neighbouring branches on which we should depend are probably degenerated like the one actually thrombosed, ready to fall victims to the same morbid process; the clot tends to spread from the one vessel to the other; and without considerable circulatory pressure the collateral tracts are not opened up. It will be gathered from these considerations that in order to arrest the advance of the clot and promote the establishment of collateral circulation, *no time is to be lost* in increasing the force of the circulation by the measures already planned. If we cannot do much good in this direction, at least let us be careful not to do harm by mistaking thrombosis for hæmorrhage and using lowering remedies.

Once the nutrition of the parts is definitely impaired, there is reason to believe that nothing will remove the thrombosis,[1] nothing arrest the softening. The best that can happen then is limitation of the affected area by the inflammatory reaction which is set up; the occurrence of a kind of repair; and the compensating action of associated parts. As far as these results are within our control they call for treatment similar to that planned in cerebral hæmorrhage under the corresponding heading; and the same remarks apply to the paralysed muscles. See page 561.

Clinical Indications.—Most of the indications furnished

[1] Gowers also speaks of the thrombus being pushed on or breaking down, *op. cit.* p. 414.

by the clinical phenomena of cerebral thrombosis are strictly symptomatic, that is, they are derived not from the phenomena directly, but from these as symptoms and signs of the great facts of ætiology and pathology. The incipient headaches, sickness, confusion of mind—especially of memory, depression, disturbed sensations in the extremities, and local weakness are invaluable guides when properly employed in this way, instead of each receiving treatment on its own account. Above all, the pulse and the characters of the cardiac signs are essential guides to the use of circulatory stimulants. At the same time, pain and other forms of distress call for relief, the measures employed being controlled by the higher indications; indeed the sickness, shock and sense of illness occurring in the invasion have to be attended to as likely to increase the depression of the circulation. Many other palliative indications, afforded by the state of the bladder, the bowels, the back, the limbs, etc., have to be observed just as in cerebral hæmorrhage. We have already seen that a more generous line of dietetic treatment must be pursued than would be correct in cerebral hæmorrhage, and that depressing methods as a whole must be studiously avoided. This plan is calculated to be of further service by improving the circulation through the other vessels of the brain than those actually thrombosed.

From the side of the *course* of thrombosis of the brain, a slight attack of the disease from which the patient has recovered can be turned to good account by directing attention to his predisposition, and to the necessity for steady observance of prophylactic measures. Paralysis is to be treated on the same principles as that from hæmorrhage. See page 561.

Embolism.

Simple as is the pathology of embolism of the brain, treatment of the disease is peculiarly difficult, unsuccessful and apparently hopeless for all time. No therapeutic problem could well appear more insoluble than how to deal with an impacted artery. If we were to increase the circulation, the plug would only be the more firmly fixed; if we were to lower

the blood-pressure, thrombosis would occur about the embolus. Meanwhile the area dependent for nourishment on the occluded vessel is undergoing rapid deterioration which will probably advance to death (necrosis, softening, white infarction). Accordingly, it is only in the arteries of the cortex, which anastomose with some freeness, that recovery can be expected; and this not because the lesion is small but because of its situation, that is, by the establishment of collateral circulation.

Ætiological Indications. — Embolism of the brain might be *prevented*, and very probably is prevented in many patients, by avoiding cardiac and general circulatory excitement. When it has actually occurred, the efficient cause of the lesion, the embolus, cannot be reached by any means in our power. And it is now too late to attempt to modify the common determining cause, excitement; or the predisposing causes, which are various morbid conditions of the heart, arteries or lungs.

Pathological Indications.—There are no means at our disposal of combating the destructive factor of cerebral embolism, that is, the impaction of some material of distant origin in an artery, and the consequent impairment of nutrition in the area of cerebral tissue which it is its function to supply. If the embolus be infective, the micro-organisms are unassailable in that situation. However, two or three elements in the embolic process as it occurs in parts of the brain are distinctly conservative or reparative in their effect. In the first place, if a cortical branch be the seat of lesion, collateral circulation may be established, and the supervention of necrosis or white softening averted. This kind of automatic recovery cannot be assisted by art. Secondly, inflammatory reaction takes place in the periphery of the infarcted and softened area, preventing extension, promoting removal of the morbid products, and finally encapsulating the lesion or proceeding to cicatrization. This part of the conservative process appears also to be beyond therapeutic control, excepting that it is promoted by general care. Thirdly, in some instances the embolus is believed to break up spontaneously; but this event is of doubtful benefit inasmuch as it leads to multiple embolism of the branches of the vessel originally occluded. Briefly, a study of the pathological char-

acters of cerebral embolism presents us with no indications that come within the range of practicable therapeutics.

Clinical Indications.—The indications to be drawn from the clinical phenomena and course of cerebral embolism are not sufficiently different from those furnished by the symptoms and course of cerebral hæmorrhage to require fresh discussion in the present place (see p. 562). Particularly low diet however is not indicated; and in some cases of failing heart with valvular disease stimulants may actually be called for, to prevent the spread of thrombosis in the blocked vessels, as well as on other principles. The management of paralysis from embolism is conducted similarly to that from hæmorrhage; compensation of the damaged parts by other parts being promoted as much as possible.[1]

Outline of Practice.

A. Preventive Treatment. *General Management.*—Moderate exercise of mind and body, short of excitement and exhaustion (p. 567). *Diet.*—Generous, with *stimulants*, in moderation (p. 567). *Medicines.*—(1) For syphilis, if present (p. 566). (2) For atheroma, if present; cardiovascular tonics and hæmatinics (p. 567): ℞ Tincturæ Digitalis ♏v, Tincturæ Nucis Vomicæ ♏v, Ammonii Carbonatis gr. iv, Ferri Tartarati gr. viii, Liquoris Arsenicalis ♏iii, Aquæ Chloroformi ad ℥i. [U.P.S. ℞ Tincturæ Digitalis ♏v, Tincturæ Nucis Vomicæ ♏v, Ammonii Carbonatis gr. iv, Ferri Tartratis gr. viii, Liquoris Potassii Arsenitis ♏iii, Aquæ Chloroformi ℥ss, Aquæ Destillatæ ad ℥i.] Three times a day immediately after meals. Habitual laxatives (p. 567): see p. 519.

B. Remedial Treatment. *General Management.*—Rest in bed. A nurse. Nursing arrangements as for cerebral hæmorrhage. See p. 564. Sinapisms to neck (p. 567). *Diet.*—Moderate, of light solids or of fluids as can be taken. *Stimulants* correct in most cases (p. 567). *Medicines.*—A mild mercurial purgative (p. 567): ℞ Hydrargyri Sub-

[1] Gowers, *op. cit.* vol. ii. p. 443.

chloridi gr. ii. Sacchari Lactis gr. ii. [U.P.S. ℞ Hydrargyri Chloridi Mitis gr. ii, Sacchari Lactis gr. ii.] At once; followed in six hours by a saline purgative. A gentle circulatory stimulant (p. 567): ℞ Tincturæ Digitalis ♏v, Spiritus Ammoniæ Aromatici ♏x, Aquæ ad ℥i. Every four hours. *Non-medicinal Measures.*—For paralysis: see page 562.

CHAPTER XXXI.

NEURITIS.

A STUDY of neuritis can hardly be said to offer us any fresh illustrations of the principles of treatment. It serves, however, to show us once more how we can never afford to forget the elementary lessons which we have learned in the preceding chapters, as we are apt to do when we allow ourselves to be distracted by the patient's distress and his urgent demands for relief. Nothing could well be more simple than the pathology of an inflamed nerve fibre, and nothing more obvious than the indications which it furnishes for rational treatment; but so prominent are its individual phenomena, particularly pain and paralysis, that the disease proper was in great measure overlooked until a few years ago. For the same reason, probably, that is, the urgency of the suffering and the disability which characterise it, neuralgia, as neuritis was commonly called, was treated only too often irrespective of its cause, which is so different in different instances that success could not possibly have been attained without respect for them individually. That the disease was remedied at all was no doubt mainly due to two circumstances, namely, that pain automatically compelled rest, and that rest promoted the disposition to spontaneous repair which is developed remarkably for so high a structure as a nerve is. All these considerations impress themselves on our minds when we have to deal with neuritis practically. Further, we shall meet here with another instance of the difficulty of determining where to draw the line between rest and exercise as means of treatment, the dangers of protracted arrest of function on the

one hand, and of premature return to activity on the other hand, being only too often appreciated.

Ætiological Indications.—The ætiology of inflammation of nerves is remarkably complete; and as most of the efficient causes are capable of easy control, being of the nature of poisons, the ætiological indications ought to be easily fulfilled. Syphilis, malaria, rheumatism and gout are to be specifically attacked with appropriate drugs when neuritis is traced to them respectively; lead, mercury, arsenic must be prevented from entering or removed from the system; the poisons of diphtheria and other acute infective diseases may be left to spontaneous elimination. With one, and by far the most common, of the poisons which cause neuritis, namely alcohol, we have great practical difficulty until the patient is so helpless that he has to keep his bed and a special nurse is placed over him. In definite forms of local neuritis the cause is commonly a temporary affair of the past, such as a wound, pressure, strain or cold, and can only be avoided in the future; but pressure may be persistent, as in the case of tumours, which ought to be dealt with individually. Neuritis caused by spreading inflammation, as of the portio dura in otitis, calls for obvious treatment. At the same time it must not be forgotten that predisposition or lack of resistance is an element in the causation of neuritis. Anæmia appears to act partly or wholly in this way, and must be met with food, air, iron, arsenic and other suitable remedies. The nervous exhaustion which attends and follows protracted anxiety and suspense, grief, or other forms of distress or misfortune — a most fruitful cause so-called of brachial neuritis for example—demands close and prolonged control of nervous influences, tonic drugs, and possibly change of air and surroundings, before pain and uselessness are overcome. The situation and relations of certain nerves, including the facial, trigeminal, brachial and sciatic, which have exposed them to cold and injury, must also be specially regarded in dealing with neuritis.

It will be seen that in the intelligent control of the ætiological factors alone of neuritis there is remarkable opportunity for the application of knowledge, and good promise of a successful result.

Pathological Indications.—The important and encouraging feature of the pathology of neuritis from the therapeutical point of view is spontaneous regeneration of the nerve fibres, ending in functional as well as structural repair. Side by side with the destructive factor of the process is seen the constructive factor, and under favourable conditions recovery is complete. The principle of treatment is therefore of the most elementary kind: to arrest degeneration and promote regeneration. Two chief means of securing the former end have been discussed already: to deal thoroughly with the cause, and to restore the normal resistance of the nervous tissues. This is a matter of time. Whilst it is being attended to, the inflammatory process is directly controlled by the radical method of rest, which will be more profitably discussed in connexion with the clinical indications by which we regulate it. Warmth, afforded by means either of dry or of moist applications, local stimulating liniments, and later on counter-irritation with iodine, cantharides or Corrigan's button, are other influences calculated to control the hyperæmia of nerve and perineurium. Acupuncture appears to be useful by providing for the escape of inflammatory products and relieving tension within the sheath. After a variable period of time devoted by means of treatment on these principles to structural repair, attention is turned to restoration of function by means of exercise. How this is to be instituted and regulated we shall presently see. Stiffness and deformity produced by neuritis yield to persevering treatment with movements, massage or nerve stretching.

Clinical Indications.—The disturbances of sensation, motion, reflex action, electrical reactions and nutrition which characterise neuritis clinically are significant of the degenerative or destructive element of the disease which we have just studied under its Pathology. They serve also as our indispensable and sufficient guides in carrying out practically the methods there discovered. The first of these methods is rest of the affected nerve, that is, practically, of the affected limb; and it also proves clinically to be compelled by pain, and entirely successful if fully and continuously employed. Yet rest is strangely neglected in neuritis. A man will lie contentedly in splints for weeks to mend a broken femur, but he may be fretful and

restless if directed to keep his bed in sciatica. Not seldom the practitioner lets him have his way, and the disease becomes an affair of months or of years. In alcoholic neuritis and in other kinds of the disease sufficient rest is insured by the paralysis; in the neuralgic types the lower limb may require to be put in a splint or supported by cushions or sandbags and bandages, the upper limb fitted with a splint or suspended in a sling. A second practical difficulty connected with the treatment of neuritis with rest is to determine when this must be stopped and changed for exercise. After what interval of time may movement of a healing nerve be safely and profitably attempted? The only guides to the solution of this problem in practice appear to be the clinical ones: the cause of the disease is not, nor are the pathological characters of it, excepting in a broad way. Pain is the plainest and surest guide of all. If after a few weeks' rest, gentle movement, whether active or passive, can be borne without distress, the severity of the means of rest should be relaxed, and next day and every succeeding day a little further liberty taken. On the contrary, if movement of the limb induce and be followed by pain, and particularly if this continue or return, it has been attempted prematurely and must not be repeated for a short time. The same principle of rest during the acute stage, followed by graduated exercise, is employed to restore the functions of the motor fibres and muscles, and therewith the nutrition also of the latter. In chronic neuritis due to lead, gentle movement may be commenced without delay. The two means available at first are electricity and massage, of which the latter appears the more valuable. The galvanic battery should first be employed, as the muscles do not respond to faradism until repair is well advanced; but as soon as they do so faradism is indicated. By these measures the nutrition of the muscles is saved from hopeless loss, and its restoration accelerated. Strychnine is very extensively ordered to promote the recovery of nervo-muscular activity. Neuritis being the morbid condition in many cases of neuralgia, a disease of which less and less is being heard, and will be heard, with the advance of pathological anatomy, there is often an urgent indication to control pain. Rest goes far to answer this necessity in many instances,

assisted if need be by the local applications and the specific remedies already referred to, such as quinine, iodides, mercury, etc., in different instances. If these measures fail, anodynes may have to be given, particularly in the fearful forms of neuralgia (occasionally neuritis) known as *tic douloureux*. The neurotic disposition of the patient must always be carefully estimated before morphine is given; or phenazone, phenacetin, exalgin, salicin, or cocaine (hypodermically) tried first. Powerful local liniments or intense local heat may also give temporary relief. Many other kinds of distress call for relief in the morbid states associated with neuritis, particularly in alcoholism. The treatment of these need not be discussed here.

In selecting the diet in neuritis, important considerations relate to the cause of the disease. In gout and rheumatism food will have to be specially ordered. When anæmia has laid the nerve open to the efficient cause, the first indication, as we have seen, is to improve the quality of the blood. The same remark applies to syphilis and other cachectic conditions. The chief duty and difficulty, however, in this connexion is the removal of alcohol when it is the cause of the neuritis, as it so often is. With a paralytic patient, fortunately, we do have a remarkably favourable opportunity of controlling drink. Elimination demands particular attention in the anæmic as well as in the gouty and rheumatic cases. Sleep will have to be induced by means of anodynes, direct or indirect, when pain is severe, as already noticed. Alcoholic subjects obtain sleep from combinations of chloral hydrate and potassium bromide, which control the restlessness or "fidgets" common during the night.

Indications from the Course.—The course of neuritis is chronic, and may be prolonged. Pain and helplessness tax the courage and endurance of the patient, who is often very sensitive, sometimes irritable and disposed to be emotional; and the restraint of enforced rest and strict diet is not always complacently borne. In the presence of these difficulties the practitioner is supported by the assurance of the fact that nerve fibres do regenerate if kept for a sufficient length of time under favourable conditions, general and local. His position therefore is one of confident perseverance in all the

measures which our knowledge of the disease suggests. Naturally when neuralgia is due to the presence of intractable or inaccessible tumours, say in the chest or cranium, the condition is desperate, but even then relief may often be afforded by specific remedies.

A large number of *complications* call for treatment in the different kinds of neuritis. Cirrhosis of the liver, for example, and a mild form of dementia not uncommonly accompany the multiple neuritis caused by alcohol.

Convalescence should be deliberately extended long after the neuritis is past. The blood and the nervous system, and in alcoholics the whole moral nature, demand prolonged attention.

Outline of Practice

I. Commencement of Case.—*General Management.*—Rest of affected part: splints, slings, bandages (p. 576); confinement to bed in some instances (pp. 575 and 576).

Diet.—Quantity and other characters regulated by cause (p. 577). *Stimulants* given or withheld according to cause (p. 577).

Medicines.—Specific remedies for the different causes (p. 574). Hæmatinics; see p. 295. Tonics; see pp. 380, 419. Various simple anodynes for local application (p. 577): (1) ℞ Linimenti Aconiti B.P. ʒi. A little to be rubbed into the painful part with care. (2) ℞ Linimenti Opii ʒiii. To be similarly used. (3) ℞ Linimenti Belladonnæ ʒiii. To be similarly used. (4) Combinations of 1, 2, and 3. Various counter-irritants (p. 575): (1) ℞ Liquoris Iodi Fortis ʒss, Tincturæ Iodi ʒss. [U.S.P. ℞ Iodi gr. xxv, Potassii Iodidi gr. xv, Alcohol ʒiii, Aquæ Destillatæ ℥xx, Tincturæ Iodi ʒss.] To be painted over the painful part. (2) ℞ Liquoris Epistastici ʒss, B.P. To be painted over the painful part, and the resulting blister carefully dressed. Various powerful anodynes for special use (p. 577): (1) ℞ Phenazoni gr. xv, Aquæ ʒi. Occasionally when pain is severe. (2) ℞ Phenacetini gr. x. In milk or broth occasionally when pain is severe. (3) ℞ Exalgini gr. iii. Occasionally when the pain is severe. (4) ℞ Salicini gr.

xv, Aquæ ℥i. Occasionally when pain is severe. (5) ℞ Injectionis Cocainæ Hypodermicæ ♏ii-♏v. [U.S.P. ℞ Cocainæ Hydrochloratis gr. $\frac{1}{5}$-$\frac{1}{2}$, Aquæ Destillatæ ♏v.] Hypodermically near the seat of pain when required. (6) ℞ Linimenti Belladonnæ ℥iii, Chloroformi ℥i. Sprinkled on warm moist spongiopiline or hot fomentation before its application to the painful part, as required. (7) ℞ Injectionis Morphinæ Hypodermicæ ♏iv-♏x. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{5}$-$\frac{1}{2}$, Aquæ Destillatæ]. (Caution, p. 577). As before. Various hypnotics: (1) A variety of powerful anodynes as above. (2) In alcoholic neuritis (p. 577): ℞ Potassii Bromidi gr. xx, Chloral Hydratis gr. xv, Tincturæ Hyoscyami ℥i, Aquæ ad ℥i. At 10 P.M.; to be repeated in three hours if necessary.

Surgical measures (pp. 574 and 575).

II. PROGRESS OF CASE.—*General Management.*—After several weeks' absence of pain, remove means of rest, and commence passive and active movements very gently (p. 576). If pain return and persist, resume rest. If pain do not persist, increase extent and duration of movements gradually.

Other Non-Medicinal Measures.—Massage and electricity (p. 576).

Medicines.—A nervous stimulant: ℞ Liquoris Strychninæ Hydrochloridi ♏v, Acidi Nitrici Diluti ♏viii, Tincturæ Aurantii ℥ss, Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{22}$, Acidi Nitrici Diluti ♏viii, Tincturæ Aurantii Amari ℥ss, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ad ℥i.] Three times a day, after meals.

CHAPTER XXXII.

TYPHOID FEVER.

The art of rational treatment as it is practised at present might be said to reach its fullest development in connexion with typhoid fever. The therapeutic lessons which the enquiring student may learn by attentive observation of a series of cases of this disease in the wards are endless; and in the same way, the young practitioner will find himself called upon to display in an intelligent and ready fashion an acquaintance with most of the principles which we have studied in this volume. More particularly, expectant treatment receives here its most comprehensive illustration. How infinitely more there is in expectant treatment than simple waiting for the virus to exhaust itself will be presently gathered: instead of a passive attitude, there are few diseases in which observation has to be more close, anticipation more keen, preparation more complete, or more to be done in the way of immediate and active interference when the indication arises. This being the case, the value of preserving the entirely natural character of the clinical phenomena and clinical course of a disease when employing them as therapeutic guides cannot fail to be appreciated, that is, the importance of disturbing the symptoms and signs of a disease as little as possible by unnecessary attempts at treatment. Further, in connexion with clinical indications we shall find in our study of typhoid fever that, whilst the necessity constantly arises of attending to individual disorders of a distressing and dangerous character such as headache, diarrhœa and delirium, it is essential to employ every means to determine in the first

place the precise pathological significance of each, whether it is evidence of bacillary action, or of toxæmia, or of exhaustion of the blood or of the viscera. This is in strict accordance with a principle which we have kept before us from the first. Typhoid fever abounds also in occasions for preventing complications or of attempting to remedy them when they have arisen. Relapse, too, is typically illustrated in this disease. From the side of means of treatment, diet will occupy a considerable amount of attention, the indications for its selection being peculiarly complex and in some respects conflicting. Lastly, it is in continued fever that the practitioner has the best opportunity of displaying all the skill he possesses in the employment of alcohol not only as a means of stimulation and support in an exhausting disease, but to counteract particular phases of grave peril in association with hæmorrhage, delirium, pulmonary congestion and the like.

ÆTIOLOGICAL INDICATIONS.—*Preventive Treatment.*—By the time that a case of typhoid fever comes under our observation it is too late to think of prevention. The older physicians recommended emetics and a brisk purge in this as in other acute specific diseases when the case is first seen;[1] and now that the efficient cause of typhoid fever is known to be Eberth's bacillus, the practice at first sight appears one that ought to be revived on rational principles. It is certain, however, that the bacilli do not reside or flourish in the lumen of the intestine (that is, in the fæces), like those of cholera, but in the substance of its wall; and there is but small chance of our being in a position to interrupt during their passage from the mouth to the ileum and expel by vomiting or purging the germs of a disease so peculiarly insidious in its invasion as typhoid fever. Nor is the other rational method of preventing or aborting typhoid fever which suggests itself to our minds more promising when carefully examined, namely, destruction of the bacillus by disinfectant drugs; and for the same reason. Calomel, corrosive sublimate, salol, beta-naphthol and many other intestinal antiseptics have been and still are employed, but their use at this stage is now abandoned.

The prevention of the spread of typhoid fever is a subject

[1] Murchison, "Continued Fevers of Great Britain," p. 655.

of public health rather than of therapeutics. Yet in every case that comes under his care the practitioner has to attend to this duty as well as to his patient, and he has further an opportunity of *pro tanto* stamping out the disease. Having notified the occurrence of the case, his chief concern will be with the proper collection and disinfection of the motions, urine and sputa. The principles are to destroy the bacilli thoroughly before disposing of the motions, lest they be carried into some water supply; to change the linen and bed-clothing frequently, and to deal strictly with every portion of them that has been soiled.

Remedial Treatment. — The bacillary nature of the cause of typhoid fever suggests direct attention to it by therapeutical measures when the disease is developed. How far this indication can be practically fulfilled we shall study presently under the head of its Pathology. It is enough to say for the present that we possess no specific for the disease.

Pathological Indications.—The first pathological events which happen in typhoid fever, as far as our present knowledge extends, are the invasion of the intestinal wall by the bacilli, and the local resistance offered to them by the phagocytosis and vascular changes in the tissues. We have here a natural provision on which we can count for assistance in the treatment of typhoid fever. A struggle is maintained between the pathogenetic and the recuperative forces. If the bacilli and their products get the mastery, a severe inflammatory process is the result, in the forms of sloughing and ulceration, killing the tissues and possibly proceeding to haemorrhage, perforation and peritonitis. Some of these effects are believed to be due to the actions of other micro-organisms which attack the structures under cover of the typhoid bacillus. After all, in the majority of cases cicatrisation follows ulceration, and repair is complete. On the other hand, phagocytosis and the inflammatory process as a whole may be successful from the first in certain individuals: the changes in Peyer's patches and the solitary follicles do not go beyond the stage of infiltration, and the destructive effects of the micro-organisms and their toxins are prevented. The question for the therapeutist to answer is how this provision for recuperation can be assisted.

In the first place, it cannot be assisted by directly assailing the bacillus in the wall of the bowel. We have seen that we possess no specific for typhoid fever. Quinine and other antipyretic and antiseptic drugs have been extensively employed, and also different antitoxins, but all without demonstrable advantage. On the other hand, great benefit ought to be derived from strict attention to the general principles for treating inflammation, and we find that these are now universally followed. Rest is the first end to be secured. The typhoid patient is at once confined to bed; he is relieved of every mechanical effort by a nurse; and in particular the correct use of the bed-pan is imperative. Physiological rest of the bowel is insured as far as possible. Routine purgation is strictly avoided; but if there be evidence of constipation at the outset, or distressing distension of the abdomen at any time, independently of grave complications, a mild aperient by the mouth or an enema should be given to remove so obvious a cause of intestinal unrest and disturbance. The food must be of such a kind and form, and given in such quantity, as to leave the least possible residue of undigested material in the gut, where the mechanical presence of lumpy curds would excite peristalsis or even directly injure the inflamed areas, and where decomposition (fermentation) with gaseous development would occur, and produce distension or even meteorism and its many unfortunate effects on the nervous and circulatory systems. It is obvious that if this elementary but all-important principle is to be fully respected in typhoid fever, we must examine the stools daily and ascertain (*inter alia*) whether they contain undigested matters. It is in this connexion, too, that we appreciate some at least of the relative advantages of milk, broths and farinaceous materials as elements of the diet in typhoid fever. Milk sometimes leaves a considerable residue of hard and fermentable curd, unless means be taken to separate the particles of casein by dilution, artificial pre-digestion, or admixture with finely divided farinaceous particles. As a rule this unfavourable effect is not produced if care be taken to keep the feeds of milk within reasonable limits—five fluid ounces eight times in twenty-four hours, in addition to beef-tea. The disposition of the patient's

friends is to over-feed him. We shall return to the subject of diet later on.

In the next place, typhoidal like every other kind of inflammation indicates removal of the products, including toxins, dead leucocytes, tissue *débris*, a variety of chemical substances formed in the bowel, any typhoid bacilli there may be in the bowel after the ninth day,[1] and associated pathogenetic (septic) and fermentative organisms. This end is to be effected by abstaining from interference with the daily evacuations, of which not more than four may be permitted with advantage.

Another necessary condition for the repair of an inflamed or ulcerated surface is cleanliness. At first sight this condition seems impossible of attainment in the bowel, but we are ignorant how far many of the organisms which inhabit the alimentary canal and their products may not be positively beneficial in this as well as in other respects. Regular evacuations, as already discussed, ought to be sufficient provision, as in health, for this purpose. There is, however, a certain amount of evidence in favour of the view that disinfectants admitted into the bowel, including mercurials, turpentine[2] and other essential oils, salol, beta-naphthol, chlorine, and phenol, do actually reduce the severity of the local symptoms and signs, and improve the general condition to such a degree and in such a manner as might be accounted for in this way. These drugs have been recommended on the principle of dealing with the typhoid bacillus both *in situ* and after absorption into the viscera, neither of which ideas will stand close examination; with their toxins locally, which is more intelligible; with the septic organisms which accompany them, also a more rational suggestion; and with the agents of putrefaction in the bowel often associated with incorrect feeding, as we shall presently see, which they are perfectly calculated to control.

Whilst most of the typhoid bacilli remain to multiply in the wall of the bowel, others pass away with the lymphatic

[1] Dreschfeld, Allbutt's "System of Medicine," vol. i. p. 800.

[2] H. C. Wood, *Med. News*, Philadelphia, 1890, vol. i.; and *Practitioner*, London, 1890, vol. xliv. p. 456.

stream: to the mesenteric glands, which undergo specific changes, still beyond our power to modify; to the blood, which becomes altered, and which deposits the micro-organisms in different parts of the body, where they set up local changes, including the heart, lungs, pleura, spleen, liver, connective tissues, etc.; as well as the kidneys and skin, by which they are expelled from the system. It would appear as if the cause of the disease had now reached perfectly inaccessible situations, unless we could promote their evacuation by the urine, lungs, and sweat. This is not an encouraging consideration. But if not the bacilli themselves, their products certainly are eliminated more rapidly by employing therapeutic measures. The conditions of success in this direction are obvious: free ingestion of fluids, thorough ventilation, and scrupulous attention to the skin. These advantages must be afforded the patient for the present reason as well as to fulfil other indications which we shall presently examine.

Clinical Indications. — The clinical phenomena of typhoid fever are very numerous and complex, and the morbid states of which they are the symptoms and signs are still in great measure obscure. Thus whilst they offer the practitioner almost endless opportunities (we might say temptations) to interfere, they are uncertain and possibly dangerous guides to treatment unless they be employed in strict conformity with the principles which we reached in Part I. of this work. The first of these general principles is to interpret the pathological significance of the phenomena before we attempt to treat them. Most of the clinical characters of typhoid fever appear to be manifestations of the local and general actions of the typhoid bacilli and other micro-organisms and their toxic products on the different organs and functions, such as the diarrhœa, tympanites, fever, splenic enlargement, bronchial catarrh and eruption; the cerebral, spinal, neural and muscular disturbances; the cardiac and vascular phenomena, pulmonary congestions, hæmorrhages, urinary disturbances and others. This view, however, is incomplete. Fever of itself no doubt accounts for part of the phenomena; so do the local lesions, both primary in the bowel and secondary in the lymphatic system, spleen, liver,

and other viscera, independently of their specific cause. Many of them are evidences of spontaneous attempts at recovery and relief. Lastly, some at least of the so-called "symptoms" and complications of typhoid fever might be and often are due to defects in the treatment and management generally—the diarrhœa in part, for example, the tympanites, the restlessness, the distended bladder, bed-sores and exhaustion. In every instance, also, not only the pathological significance of the symptom but the personal factor and the actual necessity for interference in any form must be determined. And when treatment is instituted, this must always be planned in strict conformity with the more fundamental indications derived from our knowledge of the pathogeny of typhoid fever and in subordination to them.

Proceeding on these principles, let us first consider the principal local symptoms of this disease—diarrhœa, constipation and abdominal distension. Hæmorrhage and perforation are regarded as complications.

Whatever its origin, diarrhœa is one of the common causes of exhaustion and must always be seriously regarded. But discrimination is necessary. In no disease, perhaps, is the practitioner more liable than in typhoid fever, to regard diarrhœa as "one of the symptoms" without troubling to enquire into its origin and nature; and this in spite of the fact that after all it is absent in about 40 per cent of cases, and is often replaced by actual constipation. In many instances it originates with himself and his treatment, that is, in the diet which he has ordered or permits. Diarrhœa ought to be treated on the same rational principle in typhoid fever as in its other pathological relations (see *Enteric Catarrh—Diarrhœa*, p. 496). Broadly speaking, it may proceed from either of two different causes, and call for two different lines of treatment. The first of these is indigestion, which is to be corrected by revision of the diet, after careful examination of the abdomen and the stools. The quantity of food will most probably have to be reduced. The relative proportions of milk and broth usually have to be re-adapted, the former usually being increased and the latter reduced or removed for a few days: but on the other hand, if close inspection of the motions reveal traces of undigested and

fermenting curds, and suggest that the condition or form of the milk is at fault, it will have to be peptonised, or lime-water added to each feed, or albumen water or an increased allowance of beef-tea or other fluid preparation of meat temporarily substituted. A dose of chalk mixture given after each loose motion will generally complete the improvement. The other common cause of the diarrhœa of typhoid fever is severe catarrh of the mucous membrane of the bowels in association with the morbid process and its products. Strict diet is not less necessary here than in the former case; but medicinal remedies are also demanded, including opium, given by mouth or rectum, vegetable constringents in combination with it, and possibly lead acetate.

Constipation, as we have already seen, is harmful, both mechanically to the inflamed bowel, and physiologically by provoking peristaltic unrest. It may be corrected by reducing the allowance of milk and increasing the broth in the diet; by administering simple, disinfectant or oil enemata; or by giving a mild dose of castor oil or one of the aperient waters. Tympanites of moderate degree, being a result of the accumulation of the gases of decomposition or fermentation of the fæces in a portion of the intestine weakened by the typhoidal process, also demands reconsideration of the diet. Either hot applications such as fomentations or turpentine stupes,[1] or cold [2] may give relief, and so does the administration of turpentine by enema or in capsules. Turpentine is also the only remedy that has proved of much service for meteorism; and the success of it and the gravity of the condition may probably be accounted for by regarding meteorism as an evidence of paralysis of the gut produced by toxic agents in the blood.[3] The practitioner must never forget, however, that gaseous distension of the bowels is often, perhaps most often, a symptom of the treatment rather than of the disease; that it ought to be prevented; and that the first step to take when it makes its appearance

[1] Jenner, quoted by Osler, "Principles and Practice of Medicine," 2nd ed. 1895, p. 41.

[2] Murchison, "Continued Fevers of Great Britain," 3rd ed. Edited by W. Cayley, 1884, p. 673.

[3] Treves, Allbutt's "System of Medicine," vol. iii. p. 618.

is to revise both the diet and the drugs which he is giving, particularly opium.

Let us next consider the general, systemic or constitutional symptoms of typhoid fever.

The great therapeutical problem of the principles on which fever ought to be treated has been chiefly studied in connexion with typhoid fever. Pyrexia is variously dealt with. When it is moderate (below 103°) direct treatment is confined to attention to the state of the skin, the thirst, the ventilation and temperature of the room, etc., as a part of proper nursing. If the thermometer record higher bodily temperatures, the natural effort at increased heat-loss is to be assisted by practising refrigeration. This is commonly done by means of sponging; sometimes by packing; in hospital practice or where special arrangements are available, by means of tepid baths (70° F.). Systematic bathing has unquestionably reduced the mortality of typhoid fever.[1] The routine use of direct antipyretic drugs in this disease may be regarded as abandoned. Water may be freely allowed, provided that drinking do not interfere with the regular consumption of liquid nourishment. The mouth, teeth and lips must be frequently moistened and freed from sordes. The skin is regularly washed. The tongue, heart and pulse are employed as valuable guides to the constitutional disturbance associated with the fever, and to the effect of remedies on it. We speak of them therefore as "calling for" alcohol and other forms of stimulants in some cases, not in others. The indications for commencing alcohol, its amount, the clinical evidences of its usefulness or the opposite, the substitutes that may be given for it if it disagree, such as strychnine and ammonia, and the manner in which it is to be reduced and finally stopped are subjects to be discussed presently in connexion with food and stimulants. How far the employment of stimulants has to be modified in treating complications will be discussed presently under the head of these.

Bronchial catarrh may usually be left to itself. If cough and rhonchi become prominent, mild stimulant liniments or poultices and an expectorant mixture containing squill and ammonium carbonate would be indicated; but these drugs

[1] Osler, *op. cit.* p. 38.

must not be given if there be diarrhœa. It is important to observe that the presence of pulmonary complications does not contraindicate the treatment of the fever by means of refrigeration.

The headache of the first week of typhoid fever calls for either cold or warm applications to the scalp (the hair had better be removed at once), quiet, protection of the patient from light, and cool sponging of the body generally. If it be intense, phenazone, caffeine, bromides or morphine may have to be given. Delirium must be treated by means of moral control, complete freedom from excitement, unremitting attention to regular feeding, the discriminating use of alcoholic stimulants, and drugs of which the choice will lie chiefly between opium, chloral hydrate and bromides in various combinations. The existence of pulmonary congestion as a complication would suggest caution in the use of the first two drugs, and the addition of ether and digitalis or of solution of hydrochloride of strychnine to a sedative dose of morphine that might be given. Delirium, however, and the other nervous symptoms of the typhoid state, including somnolence, coma, coma-vigil, tremors, subsultus tendinum and carphology, may often be most successfully relieved by refrigeration—sponging, packing or the bath.[1] It is especially under these circumstances that the bladder calls for attention.

Many indications relating to the management of the elementary functions of the body have already come before us under different heads in the preceding review. We are now in a position to bring them together and arrange them in practical form.

The exhaustion and debility of the patient, as well as the pathological processes within the bowel and other organs, render complete rest in bed imperative; and the earlier this is secured the better, possibly several days perhaps before the diagnosis is complete. Two intelligent, strong and experienced nurses should be secured. The room to be occupied should be specially selected and prepared so as to fulfil the following conditions:—large cubic space; an abundant supply and continuous change of pure cool air; quietness; the absence of every

[1] Osler, *op. cit.* p. 42.

unnecessary article of furniture and of all hangings, carpets and other textile materials that can be dispensed with; a well-burning coal fire; and windows that open both top and bottom and are provided with dark blinds. The bed selected should be sufficiently low to enable the nurse to lift or turn her patient easily and comfortably for both, and be so constructed and so arranged as to afford abundant ventilation all around the patient, a perfectly smooth surface, elasticity, and lightness of covering. A mackintosh and a draw-sheet are indispensable. A water-bed may be required in severe and protracted cases of typhoid fever. In addition to regular changes of the bed- and body-linen, frequent ventilation of the bedstead, mattress, pillows, etc., is indicated, an object which is best secured by moving the patient to a second bed in the same room.

Fever demands a sufficient supply of food to support life in the presence of a wasting, destructive and debilitating process; not only to maintain the resistance and the enduring resistance of the tissues, but also to afford material for repair. The diet must therefore be nutritious and abundant; and it will have to be presented in such a form that the patient will cheerfully take it in spite of anorexia, that is, in the form of fluids. Enteric fever further presents special dietetic indications as we have already seen: the food ought not to leave a solid residue in the bowel; the quantity given at each feed and the total amount given in twenty-four hours, whilst sufficient to compensate for the drain on the blood produced by diarrhœa and toxæmia, must not be excessive, lest it set up indigestion and by its products damage the affected parts both directly and indirectly; and a certain proportion of the more rapidly stimulant constituents of food are obviously calculated to be of service in a disease characterised by so much prostration. These conditions are best fulfilled by a diet consisting of 40 fluid ounces of milk and 20 fluid ounces of beef-tea or other form of broth, in twelve portions or feeds, in the course of twenty-four hours. A feed therefore consists of 5 fluid ounces, and is given every two hours; every third feed consists of broth, the other two feeds are of milk. These quantities refer to pure unskimmed milk and

the best beef-tea. If for any reason more fluid be indicated and given, it is to be added after measurement. As we have already seen, it may be necessary, in order to prevent heavy curdling, to modify the milk by simple dilution, by dilution with saccharated solution of lime, by peptonizing it, or by mixing with it a trace of a fine farinaceous food, such as arrowroot, barley water, or strained gruel. Some authorities permit the addition of coffee, tea and cocoa, which must be welcome varieties in so monotonous a diet taken for weeks on end.[1] The above directions relate to an average case of typhoid fever. If the condition become anxious, the feeds must be given at shorter intervals without increasing the total amount: for example, $2\frac{1}{2}$ fluid ounces every hour, or $1\frac{1}{4}$ fluid ounces every half-hour. The disadvantages of over-feeding, which have been already considered, are not lessened in severe cases; probably the reverse. Modifications of diet indicated in the principal complications will be discussed under that heading. The ready guides of the local fitness and success of the diet in typhoid are the number and characters of the motions, and the physical signs over the abdomen. They must be daily employed in the manner already discussed. They and not academic pronouncements are the true practical guides to "the best diet in typhoid."

Stimulants may be conveniently considered here, in connexion with food; but it must be clearly understood at the commencement of the subject that they are by no means necessarily to be employed in typhoid fever. The indications for and against their use, respectively, may be summarily stated as follows, the quantity used being, broadly speaking, in proportion to the severity of the symptoms:—*Indications for alcoholic stimulants:*—Pulse: over 120, irregular or intermittent, very soft, very feeble. Heart: impulse feeble or imperceptible; disappearance of the first sound. Tongue: dry, brown, raw, fissured. Nervous and muscular systems: muttering delirium, coma, coma-vigil, tremors, subsultus, carphology. Food: badly taken or vomited. Diarrhœa: severe. Skin: moist. Age: older subjects. Habits: alcoholism. *Indications against alcoholic stimulants:*—Stimulants are

[1] S. Phillips, *Brit. Med. Journ.*, London, 1898, vol. ii. p. 1487.

unnecessary, and not to be ordered, in the opposite conditions of pulse, tongue and other guides to those just enumerated. If given under these circumstances, alcohol is calculated to disorder the stomach and liver, excite the heart and the nervous system, and tax the kidneys, disturbing instead of calming the patient, preventing sleep, increasing the debility and possibly raising the temperature. It is said to disagree when the skin is dry.[1] If the practitioner be in doubt which course to pursue, he ought to try the effect of small doses, himself noting the pulse before and after administration, and the nurse observing any change in the nervous symptoms, favourable or otherwise, that may arise. In place of alcohol when for any reason it is not given, or in addition to it in conditions of extreme urgency, other stimulants may be employed, including the spirits of ether and ammonia, ammonium carbonate, digitalis or its allies, and particularly strychnine under the skin.

With respect to sleep, somnolence is a common phenomenon in typhoid fever, and the nurse is not to interfere with it beyond rousing the patient at regular intervals to be fed. The opposite condition, insomnia, is sometimes very distressing, particularly during the first week along with headache. The advantages of a quiet, shaded, cool, airy room are appreciated under these circumstances, and cold sponging of the face and kind intelligent nursing will often act as indirect hypnotics. If these measures fail, recourse must be had to drugs, such as morphine, sulphonal, paraldehyde, bromides, chloral hydrate or chloralamid, according to the condition of the patient otherwise. Unless specially contraindicated, morphine or one of the fluid preparations of opium is the best.

In every case of typhoid fever the personal factor must be faithfully estimated and respected. The ability to withstand the toxic action of the typhoid products is very differently possessed by different individuals, according to inherited or acquired vitality, at different ages and under different circumstances, as well as in relation to their power of assimilating nourishment. Age markedly affects the prospect of recovery, and therefore influences the treatment. Women are in many

[1] Murchison, *op. cit.* p. 291.

respects more easily nursed through typhoid fever than men, who particularly resent the use of the bed-pan and frequently imperil their chances of recovery in this simple way. On the other hand, the pregnant and puerperal states add to the gravity and modify the treatment of the disease in women. Temperament and occupation impress their mark on the phenomena of typhoid fever, particularly the nervous disturbances. Of the different "habits," alcoholism has most influence on the symptoms and on treatment.

INDICATIONS FROM THE COURSE.—The life of the typhoid bacillus within the body appears to be limited. Locally its activity declines and is finally crushed by the natural processes of resistance and recovery. Specifically the action of the toxin becomes weaker from diminished formation and continued excretion, and from the development of antitoxin; the normal phenomena of the tissues and organs gradually reappear; and presently only exhaustion, anæmia and emaciation remain as effects of the severe illness from which the patient is emerging. Thus recovery ensues, locally and generally: tissue endurance has proved invaluable in a process which, severe though it be, is of limited length. This is the course of the fever in a favourable case, extending to 21 or 28 days: it is acute but somewhat prolonged.

The line of treatment indicated by a disease of this course is broadly speaking *expectant*, that is, expectant in the correct sense of the term as defined in Part I. p. 147. The qualities demanded of the practitioner and nurse are mainly those which have to be displayed in every case of acute disease (p. 151), particularly courage, hopefulness and cheerfulness, close and continuous observation, attention to details, and unsparing devotion to duty. But other qualities are also required in the management of typhoid fever. The course of the disease, whilst of fairly definite duration, is extremely variable and therefore uncertain from day to day, in different individuals, as we have just seen, and in respect of both its local and its systemic developments to be presently studied under the heads of Complications, Relapse and Sequelæ. The first practical lesson we learn from this consideration is never to make light of a case of typhoid fever, however mild, from

its invasion until the completion of convalescence. Equally important is it from this point of view to take no liberties, unless there be cogent reason, with the plan of treatment which we have laid down for the case. Thirdly, as a complement of these two lessons, the uncertain course of typhoid teaches us another: to attend to the smallest changes in the symptoms at each visit—in the pulse, temperature, aspect, stools, etc., the way in which food is taken, the effects of stimulants, the amount of sleep obtained, and the occurrence of delirium; and to act accordingly. The practitioner must never lose his reckoning of the day of the disease; and will always call to mind the corresponding stage of the pathological process within the bowel as a guide to his management of the period and the changes still to come. Therewith he must daily estimate the loss or gain, by the pulse, heart, temperature, tongue, posture, aspect and condition of the cerebral functions. It is under these circumstances, and with these estimates before him, that he will have to decide as to the frequency and size of the feeds, the amount of stimulant, whether increase or decrease, and possibly the still more assiduous attention of the nurse.

Indications from Complications.—The typhoid process is frequently characterised by the occurrence of complications. These originate in different ways, some of which have to be specially noticed. In the first place, the typhoid bacilli fall upon other organs rather than the bowel, whether at the commencement or at a later period of the disease. Acute pneumonia, pleurisy and nephritis occur in this connexion, and also necrosis of bones and vascular thrombosis. Each of these diseases will require its proper treatment with obvious modifications. In other cases the toxic action of the bacilli and their products may be unusually severe: whether absolutely, or relatively to the resistance of the patient. The treatment of violent delirium and profoundly marked typhoid state has been already sufficiently noticed. Epistaxis may call for plugging of the nares. Hyperpyrexia must be promptly met with refrigeration.

Congestion of the lungs is always a cause of anxious concern. It chiefly signifies cardiac weakness, and ought to be regarded as an indication for the circulatory stimulants

already mentioned. Being partly the effect of local gravitation, in the absence of cardiac force, it will be relieved, and should be prevented, by changing the cubitus of the patient from time to time. In profound prostration with unconsciousness, broncho-pneumonia is sometimes caused by inhalation during swallowing, and the nurse must be specially instructed to exercise great care in feeding the patient under these circumstances.

Intestinal hæmorrhage, a grave complication most common during the third week, demands immediate and close treatment, ordered on the principles which we have elsewhere determined (p. 87). The first or most urgent necessity is rest, which promotes spontaneous closure of the broken and bleeding point, lowers the arterial pressure, and permits clotting: rest physically, of the body as a whole; rest physiologically, of the bowel; rest mentally also. Naturally it is difficult to increase the care that is already being exercised in the first of these respects by both practitioner and nurse. It is advisable, however, to avoid even the movement on to the bed-pan, and to collect the motions in a properly arranged towel. Physiological rest of the bowel is secured by reducing the diet to a minimum, giving, for example, half an ounce of peptonized milk every half-hour, or a teaspoonful of meat jelly every hour. Thirst may be relieved by wetting the tongue and lips, or with a teaspoonful of quite warm water, plain or acidulated, which is better than ice. Therewith a hypodermic injection of morphine completes the arrest of peristalsis; and this has the further effect of producing sleep and mental rest, the latter however being hardly necessary as the patient is not always conscious. An attempt must also be made to close the bleeding vessel by means of astringents, the most powerful combination of which is a mixture of lead acetate, morphine acetate and diluted acetic acid in water, given at short intervals, or the lead and opium pill, or the compound lead suppository. An ice-bag properly applied to the right iliac fossa for a short time can hardly fail to promote the same effect. Under this system of treatment most, perhaps all, is being done that is at present possible for the arrest of intestinal hæmorrhage in typhoid fever. Many other remedies have been recommended, including

especially ergot, hamamelis[1] and turpentine, but nothing in therapeutics is so unsettled and uncertain as the effect of medicinal hæmostatics. Briefly we may say, that the treatment of a severe case of intestinal hæmorrhage in typhoid fever consists in preserving life at a low ebb for one or two days, being content if the circulation is maintained at a pressure short of permitting syncope provided fresh bleeding does not occur. The pulse is our best guide in the difficult task of steering the middle course between two dangers of such gravity, but the motions and temperature must also be closely watched. One of our greatest difficulties in this respect proves to be perhaps our chief aid when properly ordered, namely the use of alcohol. Brandy is to be given, with the finger on the pulse, in greatly reduced doses at very short intervals, for instance 30 minims every half-hour in the tablespoonful of milk; so that whilst the heart is never excited by the alcohol, its strength is sustained, and not less than three fluid ounces are consumed in twenty-four hours. When the hæmorrhage ceases, and as the circulation and temperature improve, the strictness of these measures will be gradually relaxed.

Perforation, and peritonitis from any other cause, call for immediate surgical interference. No reliance can be placed on medicinal remedies. See *Acute Peritonitis*, p. 535.

Bed-sores ought to be prevented by attention to strict cleanliness and the details of proper fever-nursing. If they occur they call for surgical treatment. Casual complications, such as pregnancy, the puerperal state, tuberculosis, and other diseases, acute or chronic, will demand special treatment, which need not be discussed here. Injudicious treatment and want of treatment are responsible for some of the complications of typhoid. We have already referred to this subject when dealing with diarrhœa, tympanites, paralysis of the bladder and bed-sores. Drug-intoxications were common when medicinal antipyretics were in fashion. Perforation is sometimes traceable to improper feeding, to bad nursing, or to the patient's refusal to go to bed. Nothing short of knowledge and care will prevent these unhappy results.

[1] S. Phillips, *loc. cit.* p. 1488.

INDICATIONS FROM RELAPSE AND RECRUDESCENCE.—True relapse and recrudescence of the process *ab initio* during the course of the primary attack (intercurrent recrudescence) are comparatively common in typhoid fever. The pathology of this event being still undetermined, the means of preventing it, which is the principal indication to be drawn from it, are unknown. If it depend on infection of a fresh portion of the intestine, as there is good evidence to believe, the importance of attention to regular action of the bowels, already insisted on, becomes still more obvious. The second indication is to treat relapse or recrudescence, when it arises, on the same principles as the original attack.

INDICATIONS FROM CONVALESCENCE.—The period of convalescence in typhoid fever is not free from serious danger. As we have seen, relapse and sequelæ are comparatively common, and even such a complication as perforation may occur after the patient is up and about. The indication is therefore to proceed with the greatest caution in taking the different steps forward which are usual in convalescence, and more particularly to turn a deaf ear on the requests of the patient and his friends for premature licence in diet and movement. As regards return to solid food, the mute appeal of the patient's hungry eyes is more difficult to resist than his spoken protests. The principal dangers to be avoided are, on the one hand, true relapse, irregular pyrexia and perforation; on the other hand, exhaustion of the blood and viscera with disposition to venous thrombosis and a low persistent type of pyrexia. Different guides may be employed to the proper course to follow. First, lapse of time: solid food may be safely allowed after the seventh day of complete apyrexia, that is, in an average case, at the beginning of the fifth or sixth week; indeed some authorities permit it as early as the third day. Second, the symptoms present: including the temperature, pulse, tongue, appetite, bowels, anæmia, debility, and appearance of general fitness to take and digest solids. Third, the result of cautious experiment. There can be no question but that, keeping the two first considerations constantly before our minds, the third guide is the most convenient one to follow in practice. To begin with, most

patients are perfectly content to live for a couple of days on a *promise* of something more substantial to come. The next step is to give precisely the same foods as before for one or two days but in solid form—the milk as carefully prepared plain junket: milk and egg as baked custard; broth in the form of jelly. All going well, of which the absence of pyrexia for twenty-four hours will be one of the readiest evidences, farinaceous thickenings are now allowed: blanc-mange, milk-puddings, peptonized foods, savoury farinaceous puddings made from beef-tea, bread and milk thoroughly soaked, and the like. By this time, also, a lightly boiled egg, eaten with a dry rusk and carefully prepared tea, coffee or cocoa, may be ordered for breakfast and tea. Boiled fish, lean underdone mutton and white meats, with boiled rice or *puree* of potato, and finally the ordinary wholesome diet of advanced convalescence, will follow each other in due course. At the commencement of convalescence brandy is gradually removed, but ought to be replaced by an allowance of sound red wine. The condition of the bowels should still be closely watched, and constipation relieved by enemata should it arise.

Similar care must be exercised with respect to movement and mental effort. With the commencement of more generous diet, the patient is cautiously permitted to sit up in bed for a very short time and to see a friend for a few minutes. In the course of a few days he will be moved to a couch; and if he be benefited by the change, advance may be steadily continued. Thenceforward, unless interrupted by sequelæ, convalescence is to be conducted on the principles which apply after acute disease of every kind, the severe anæmia produced by typhoid fever being particularly regarded. See Part I. p. 165.

Indications from Sequelæ.—Some of the most common and severe sequelæ of typhoid fever have now been traced to the presence either of the specific bacillus or of other micro-organisms in the remote tissues. These are cellulitis, bubo, periostitis, arthritis, otitis and empyema. No way of preventing these affections is at present known, and if they occur they will have to be treated on ordinary principles. A series of nervous sequelæ, including insanity and other cerebral disorders or diseases, myelitis and spinal scleroses,

neuritis and various functional disturbances, appear to be partly toxic, partly anæmic in origin, and therefore indicate the necessity for prolonged and intelligent treatment with medicinal and non-medicinal measures; but the bacillus has been found in some of the lesions and recovery may be impossible. Venous thrombosis occurring at this or an earlier stage calls for recognised treatment, and may lead to permanent obstruction and œdema, requiring constant elastic support.

Outline of Practice.

1. Commencement of Case.—*General Management.*—Rest in bed; arrangements for illness of one or two months. Two intelligent, experienced, strong nurses. Room, bed, clothing: see pp. 589, 590. Strict attention to cleanliness and disinfection; draw-sheet changed at least twice a day, under-sheet daily, over-sheet every second day, night-shirt and day-shirt daily. Tepid water and soap night and morning. Use of bed-pan imperative, the nurse lifting patient and an assistant placing pan in position. Disinfection of stools, urine and sputa (p. 582).—*Sponging* in draw-sheet with water at 80°, 60° or lower F. if temperature reach 103° (p. 588).—*Diet.*—Fluids only (p. 590); 5 fl. oz. of milk or of beef-tea every two hours; two of the former feeds to one of the latter. Milk simply boiled, peptonized, or variously diluted and flavoured (p. 591). —*Stimulants.*—Not as a routine. Brandy best; either with the milk, or, if unpalatable, in water. Indications for and against alcohol: (p. 591).—*Medicines.*—None as a routine. For marked constipation (p. 587): (1) ℞ Misturæ Olei Ricini ℥i. [U.S.P. ℞ Olei Ricini ℥iii, Mucilaginis Acaciæ ℥iss, Aquæ Aurantii Floris ℥i, Aquæ Cinnamomi ℥iiss.] At once. (2) A soap-and-water enema, one pint.—A variety of intestinal disinfectants (pp. 581, 584): (1) ℞ Liquoris Hydrargyri Perchloridi ♏xxx, Aquæ ad ℥i. [U.S.P. ℞ Hydrargyri Chloridi Corrosivi gr. $\frac{1}{32}$, Aquæ Destillatæ ℥i.] Every four hours. (2) ℞ Olei Terebinthinæ ♏x. In a capsule three times a day. (3) ℞ Olei Terebinthinæ ♏x, Misturæ Amygdalæ ℥i. [U.S.P. Emulsionis Amygdalæ ℥i.] Three times a day. (4) ℞ Salol gr. x. In *cachet* or in broth, three times a day.—For severe

headache (in addition to either cold or warm applications to scalp, etc. p. 589): (1) ℞ Potassii Bromidi gr. xx, Tincturæ Cardamomi Compositæ ♏x, Aquæ Cinnamomi ad ℥i. Every four hours, if required. (2) ℞ Phenazoni gr. x, Aquæ ℥i. Every four hours, if required. (3) ℞ Caffeinæ Citratis Effervescentis ʒi, Aquæ ℥iv. At once.—For insomnia or nocturnal restlessness: (1) ℞ Tincturæ Opii ♏x-xx, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Tincturæ Opii ♏viii-xvi, Aquæ Camphoræ ʒii, Aquæ Destillatæ ad ℥i.] At 8 P.M. (2) Other hypnotics: see p. 418.—Mouth and teeth to be cleaned every four hours with glycerin and lemon juice (equal parts) on cotton-wool mops (p. 588).

II. Progress of the Case.—*General Management.*—As before. Patient to be turned occasionally on to side, and supported with pillows at back. Heels carefully protected from pressure.—*Diet.*—As before: regulated by examination of abdomen and motions at daily visit (pp. 586, 591). Half feeds ($2\frac{1}{2}$ fl. oz.), or milk only, or changes in relative proportions of milk and broth, as required (p. 591).—*Stimulants.*—As before, according to same guides (p. 591).

Complications.—*For diarrhœa,* beyond four motions in twenty-four hours, and after examination of these:—Consideration of diet (p. 586).—A variety of intestinal astringents: (1) ℞ Misturæ Cretæ ℥i. After every loose motion. (2) ℞ Tincturæ Opii ♏v-xv, Acidi Sulphurici Aromatici ♏xx, Tincturæ Catechu ♏xxx, Aquæ Menthæ Piperitæ ad ℥i. [U.S.P. ℞ Tincturæ Opii ♏iii-x, Acidi Sulphurici Aromatici ♏xv, Tincturæ Catechu Compositæ ʒi, Aquæ Menthæ Piperitæ ad ℥i.] Every third or sixth hour when required. (3) ℞ Bismuthi Salicylatis gr. xx. Three or four times a day in milk or broth. (4) ℞ Tincturæ Opii ♏xx-xxx, Mucilaginis Amyli ℥ii. [U.S.P. ℞ Tincturæ Opii ♏xv-xx, Mucilaginis Amyli ℥ii.] As an enema. See also p. 504.—*For tympanites.*—Reconsideration of diet (p. 587); (1) ℞ Olei Terebinthinæ ♏v-x, in capsule. (2) ℞ Olei Terebinthinæ ♏v-x, Misturæ Amygdalæ ℥i. [U.S.P. ℞ Emulsionis Amygdalæ ℥i.] At once.—*For severe bronchial catarrh or pulmonary congestion.*—Stimulant expectorant mixtures (pp. 588, 594): (1) ℞ Ammonii Carbonatis gr. iv, Tincturæ Scillæ ♏xx,

Aquæ Chloroformi ad ℥i. [U.S.P. ℞ Ammonii Carbonatis gr. iv, Extracti Scillæ Fluidi ♏iv, Aquæ Chloroformi ℥iv, Aquæ Destillatæ ℥iv.] Every four hours. (2) ℞ Olei Terebinthinæ ♏x, Spiritus Chloroformi ♏xx, Spiritus Ætheris ♏xx, Spiritus Juniperi ♏xx, Mucilaginis Acaciæ ℥i, Aquæ Menthæ Piperitæ ad ℥i. Every three hours. *For insomnia:* as before. *For delirium* (in addition to non-medicinal measures, p. 589): (1) ℞ Liquoris Morphinæ Hydrochloridi ♏xxx [U.S.P. ℞ Morphinæ Hydrochloratis gr. $\frac{1}{4}$, Aquæ Destillatæ ♏xxx] (caution, p. 589), Aquæ Camphoræ ad ℥i. At 8 P.M.; repeated in three hours if required. (2) ℞ Injectionis Morphinæ Hypodermicæ ♏v, Liquoris Strychninæ Hydrochloridi ♏iii. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{4}$, Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏v-x.] Subcutaneously at 8 P.M.; repeated in four hours if required. (3) ℞ Syrupi Chloral ℥iss, Potassii Bromidi gr. xv, Tincturæ Digitalis ♏x, Aquæ ad ℥i. [U.S.P. ℞ Chloralis gr. xv, Potassii Bromidi gr. xv, Tincturæ Digitalis ♏x, Aquæ Destillatæ ad ℥i.] At 8 P.M.; to be repeated in four hours if required. (4) ℞ Extracti Opii Liquidi ♏xx, Tincturæ Digitalis ♏x, Spiritus Ætheris ♏xx, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Tincturæ Opii ♏xv, Tincturæ Digitalis ♏x, Spiritus Ætheris ♏xx, Aquæ Camphoræ ℥iv, Aquæ Destillatæ ad ℥i.] At 8 P.M.; and half a dose in 2 hours if required. See also p. 418. —*For failure of heart* or great nervous prostration, particularly if alcohol prove insufficient or unsuitable (p. 592): (1) ℞ Spiritus Ætheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii ♏x, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Spiritus Ætheris ♏xxx, Spiritus Ammoniæ Aromatici ♏xxx, Tincturæ Aurantii Amari ♏x, Aquæ Camphoræ ℥iv, Aquæ Destillatæ ad ℥i.] When required. (2) ℞ Tincturæ Digitalis ♏xv, Ammonii Carbonatis gr. iv, Spiritus Ætheris ♏xxx, Aquæ Camphoræ ad ℥i. [U.S.P. ℞ Tincturæ Digitalis ♏xii, Ammonii Carbonatis gr. iv, Spiritus Ætheris ♏xxx, Aquæ Camphoræ ℥iv, Aquæ Destillatæ ad ℥i.] Every three hours, as required. (3) ℞ Liquoris Strychninæ Hydrochloridi ♏iii. [U.S.P. ℞ Strychninæ Hydrochloratis gr. $\frac{1}{30}$, Aquæ Destillatæ ♏v.] Hypodermically. Every six hours, if necessary.—*For intestinal hæmorrhage.* General

management, local measures, and special diet (pp. 595, 596); special use of stimulants (p. 596). — Rapid and powerful sedatives of circulation, bowels and nervous system: (1) ℞ Injectionis Morphinæ Hypodermicæ ♏iv-v-viii, Liquoris Atropinæ Sulphatis ♏i. [U.S.P. ℞ Morphinæ Tartratis gr. $\frac{1}{5}$-$\frac{1}{4}$-$\frac{2}{5}$, Atropinæ Sulphatis gr. $\frac{1}{110}$, Aquæ Destillatæ, ♏x.] At once. (2) ℞ Plumbi Acetatis gr. iii, Liquoris Morphinæ Acetatis ♏xxx, Acidi Acetici Diluti ♏xx, Aquæ ad ℥i. [U.S.P. ℞ Plumbi Acetatis gr. iii, Morphinæ Acetatis gr. $\frac{1}{4}$, Acidi Acetici Diluti ♏xx, Aquæ Destillatæ ad ℥i.] At once; repeated every three hours if necessary. (3) Mitte Suppositoria Plumbi Composita iv. [U.S.P., ℞ Pulveris Opii gr. iv, Plumbi Acetatis gr. xii, Olei Theobromatis ℥i, Misce et fiant Suppositoria No. iv.] One to be administered every four hours if necessary. (4) ℞ Tincturæ Hamamelidis ♏v, Aquæ ℥ss. [U.S.P. ℞ Extracti Hamamelidis Fluidi ♏i, Aquæ Destillatæ ℥iv.] Every half-hour whilst hæmorrhage continues. See also p. 447.

Recrudescence.—See p. 597.

Relapse.—See p. 597.

Convalescence.—See p. 597. *Diet.*—Gradual return to solid food: guides, p. 597. *Medicines.*—Hæmatinic tonics: See pp. 279, 521.

Sequelæ.—See p. 598.

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